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Materials Handling Equipment

Maintenance Manual

Navy Department
Navy Supply Systems Command
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MATERIALS HANDLING EQUIPMENT
MAINTENANCE MANUAL

NAVSUP PUBLICATION 538
Change 1

NAVY DEPARTMENT
Naval Supply Systems Command
Washington, DC 20376, 1 Apr 1984

This change, which has been reviewed and approved, revises page 6 and replaces DD Form 1362--Unsatisfactory Report with Standard Form 368--Quality Deficiency Report on pages 6a and 6b.

Pages attached hereto will be inserted in numerical sequence and correspondingly numbered pages will be removed and destroyed.

This change sheet will be retained and inserted as the last sheet of the publication.

[redacted]
Vice Commander
Naval Supply Systems Command

MATERIALS HANDLING EQUIPMENT MAINTENANCE MANUAL

NAVSUP PUBLICATION 538

NAVY DEPARTMENT
Naval Supply Systems Command
Washington, DC, 30 October 1981

This publication is issued for the information and guidance of all interested personnel of Forces Afloat and Ashore Activities having a direct or related responsibility for the maintenance of materials handling equipment, and is in accordance with basic policies and responsibilities assigned by the Secretary of the Navy. It supersedes SPCC Publication 10490 of February 1980, which superseded NAVSUPINST 10490.32 of 8 June 1973. Afloat activities are required to comply with the 3M Systems, Ships Maintenance and Material Management, as delineated by the Office of the Chief of Naval Operations under OPNAVINST 4790.4 and OPNAVINST 4790.2B.

This publication contains technical information on the subject of preventive maintenance of materials handling equipment and related cost accounting standards, and has been reviewed and approved.

[redacted]
Vice Commander
Naval Supply Systems Command

FOREWORD

The successful operation of materials handling equipment is dependent upon the following criteria:

1. Good design
2. Optimum materials in construction
3. Evidence of good workmanship in assembly
4. Proper and periodic maintenance

The first three cannot be influenced by equipment operator or maintenance personnel; but end use of any equipment item cannot be efficient and successful without consideration for proper and periodic maintenance. The importance of this maintenance cannot be over-emphasized.

This publication considers the fourth point as the preventive maintenance central theme throughout the entire presentation. It is issued to guide all personnel directly or indirectly responsible for maintenance of materials handling equipment, and is in accordance with basic Naval Establishment policies.

RECORD OF CHANGES

Change No.	Date of Change	Date Entered	Signature of Person Entering Change
Change 1	~~June 10, 1997~~ April 1989	June 10, 1997	[illegible]

MATERIALS HANDLING EQUIPMENT MAINTENANCE MANUAL

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SECTION 1—INTRODUCTION

1.1.1 Purpose

The purpose of this instruction is to present the preventive maintenance procedures pertinent to the operation and handling of all powered and nonpowered materials handling equipment (MHE) commonly used in warehousing, on board Navy ships, and dockside loading and unloading.

1.1.2 Scope

The instruction is divided into four chapters, plus an appendix. Chapter 1 gives a general introduction, Chapter 2 discusses specific preventive maintenance procedures, Chapter 3 outlines cost control procedures, and Chapter 4 gives repair time standards. Appendix A is an index of figures (illustrations). The publication is a compilation of all relevant information now available to the Navy Ships Parts Control Center (SPCC), and is designed to:

a. Inform and instruct operators and maintenance personnel about the importance of preventive maintenance procedures outlined in this publication and those in the individual manufacturers' technical manuals which accompany each unit of MHE.

b. Assist shop inspectors to perform detail preventive maintenance inspections that will help forestall equipment malfunctions.

c. Outline preventive maintenance service schedules for the equipment.

The foregoing enumeration covers the organization and general content of this Instruction. Other maintenance procedures, relating to complex or critical sub-systems and components (e.g., batteries, fuel injection, solid-state controls), are highlighted and covered in appropriate detail in the text.

The 3M systems, Maintenance Material Management as delineated by the Office of the Chief of Naval Operations under OPNAVINST 4790.4 and OPNAVINST 4790.2B, are the nucleus for managing maintenance aboard all ships of the Navy. Their purpose is to provide all maintenance and material managers throughout the Navy with means to plan, acquire, organize, direct, control and evaluate manpower and material resources expended or planned for expenditure in support of maintenance.

SECTION 2—GLOSSARY OF TERMS

1.2.1 Preventive Maintenance

Preventive maintenance is that maintenance which is the responsibility of and performed by a using organization on its assigned equipment. It consists of the inspection, servicing, surveillance, adjusting, and lubrication of equipment in order to minimize breakdown and keep equipment in optimum operating condition.

1.2.2 Materials Handling Equipment (MHE)

Materials handling equipment consists of the powered and nonpowered types of equipment normally used in the loading, unloading and stacking/stowage of material in warehouses, on board ships, and at dockside.

1.2.3 Repair

Repair, as the term is used here, denotes the procedure or method(s) used to return an equipment to operational condition after failure.

1.2.4 One-Time Repair

The one-time repair expenditure limits for MHE are applicable to each complete repair job performed on a machine.

1.2.5 Accumulated Repair

The accumulated repair expenditure limits are applicable to the sum of all scheduled inspection and repair costs incurred during the entire life of the item. This will include the price of parts actually consumed in the repair operation, the exchange charge for complete assemblies or subassemblies installed, and all direct and indirect (shop charges only) labor involved.

CHAPTER 2—PREVENTIVE MAINTENANCE

SECTION 1—INTRODUCTION

2.1.1 Purpose

The purpose of this chapter is to present the basic preventive maintenance practices which will assure the satisfactory performance of materials handling equipment.

2.1.2 Scope

Chapter 2 is divided into two sections. Section 1 presents the introduction to preventive maintenance; and Section 2 discusses preventive maintenance procedures that are applied to all types of materials handling equipment and the components thereof.

2.1.3 Responsibilities

Preventive maintenance is the direct responsibility of personnel assigned to maintenance shops, and the indirect responsibility of personnel who operate materials handling equipment.

Maintenance Management of USN 12-00000 series, weight handling equipment, cranes requires a comprehensive maintenance, testing and inspection program and is a prerequisite to insuring safe and reliable crane operation. The elements of this program are contained in NAVFAC P-300, Management of Transportation Equipment. Section 3 of this publication has been developed by the Naval Facilities Engineering Command (NAVFACENGCOM), to provide specific schedules and requirements for crane maintenance, inspection, and testing.

For specific preventive maintenance, corrective maintenance, scheduled inspections, scheduled lubrication and inspection of safety devices, reference should also be made to the manufacturers technical manual that is supplied with the equipment.

The application of NAVFAC P-306, Testing and Licensing of Weight Handling and Construction Equipment Operators, is recommended for the licensing of operators for the USN 12-00000 series (mobile cranes) of Material Handling Equipment.

2.1.3.1 Operator Training. Operator training shall be conducted as outlined in Storage and Materials Handling, DoD Regulation 4145.19R-1. The licensing and testing program set forth in this publication is oriented to forklift trucks and warehouse tractors. Examination for other equipment should be formulated as needed. NAVFAC P-306, Testing and Licensing of Weight Handling and Construction Equipment Operators, provides excellent guidance in this area. The application of NAVFAC P-306 is recommended for the licensing of operators for the USN 12-00000 series, cranes, of Materials Handling Equipment. All of these training methods, when properly applied in the instruction of operators of materials handling equipment, can contribute to minimizing the need for equipment maintenance and repair. In addition to instructing equipment operators, a portion of the above course should be attended by shop inspectors in order that they may keep current with new concepts pertinent to equipment maintenance.

2.1.3.1.1 Handling Hazardous Materials. All operators of power-operated industrial material handling equipment handling ammunition and hazardous materials should be qualified and certified by completing the training outlined in DoD Regulation 4145.19R-1. A standard operators permit will be the U.S. Government identification card as prescribed in DoD Regulation 4145.19R-1. In addition, the operator should be familiar with NAVSEA OP 4098, Handling Ammunition, Explosives, and Hazardous Materials.

2.1.3.2 Operator Responsibilities. Daily, prior to placing equipment in operation, the operator will be responsible for:

1. Checking fuel, coolant, and crankcase oil levels.
2. Checking operation of lights, brakes, windshield wipers, gauges, horn, and hydraulic controls.
3. Checking tire pressure, condition of tires, and external condition of equipment.
4. Clean outside of radiator with compressed air if applicable.
5. Determining presence of required tools and safety equipment.

Any defects, that could affect the safety of the personnel operating the equipment, or the operating condition of the equipment, must be noted during the above check and corrected before the equipment is placed in operation. These defects will be reported by use of the Notice of Unsatisfactory Operation (Materials-Handling Equipment) (NAVSUP Form 1280) Figure 16, Chapter 3. It must be emphasized that operators shall not perform repairs or adjustments on the equipment at any time.

In addition to these daily checks, the operator will be responsible for determining that the equipment is never overloaded, since each truck has a rated load capacity which, if exceeded, causes added strain on all component parts; increases maintenance; and shortens equipment life. Further, he will never abuse the equipment in a

PREVENTIVE MAINTENANCE GUIDE
NAVSUP FORM 1377 (2-81)

REGISTRATION NO.	TYPE OF EQUIPMENT	HR METER READING	JOB ORDER NO.	DATE

LUBRICATION†	SCHEDULED	PERFORMED
1. ENGINE OIL: DRAIN AND REFILL (FLUSH*)		
2. LUBRICATE *(Use available chart)*		
3. TRANSMISSION (FLUSH*)		
4. DIFFERENTIAL (FLUSH*)		
5. CARBURETOR AIR CLEANER: REMOVE-CLEAN-OIL		
6. OIL FILLER-PIPE CAP: REMOVE-CLEAN-OIL		
7. CRANKCASE BREATHER: REMOVE-CLEAN-OIL		
8. BATTERY: CHECK WATER LEVEL-CLEAN TERMINALS		
9. CHAINS: OIL		
10. RADIATOR: CHECK WATER LEVEL (ANTIFREEZE*) (FLUSH*)		
11. HYDRAULIC RESERVOIRS: CHECK-ADD FLUID (FLUSH*)		

SIGNATURE	DATE

OPERATIONAL INSPECTION†	SCHEDULED	PERFORMED
1. INSTRUMENTS AND SWITCHES		
2. BRAKES: SERVICE AND PARKING		
3. INCHING CONTROL		
4. CLUTCH: FREE PLAY-SLIPPAGE		
5. STEERING: RESPONSE-EFFORT		
6. TRANSMISSION: SPEED RANGES AND CONTROLS		
7. HYDRAULIC CONTROLS: LIFT SPEED & RETENTION OF ELEVATED RATED LOAD		
8. SAFETY: HORN-LIGHTS-OVERHEAD GUARD-FIRE EXTINGUISHER		

SIGNATURE AND DATE

INSPECTION AND SERVICING†	SCHEDULED	PERFORMED
1. VEE BELTS: INSPECT-ADJUST		
2. SPARK PLUGS: CLEAN-ADJUST-TEST		
3. FUEL PUMP BOWL AND FILTER: CLEAN		
4. WIRING: INSPECT FOR BREAKS AND ATTACHMENTS		
5. GENERATOR: BRUSHES-COMMUTATOR (FLUSH*)		
6. STARTER: BRUSHES-COMMUTATOR (CLEAN*)		
7. DISTRIBUTOR (INSPECT*)		
8. CARBURETOR: ADJUST (CLEAN*)		
9. GOVERNOR: INSPECT AND ADJUST *(Use tachometer)*		
10. EXHAUST SYSTEM*		
11. LIFT CHAINS AND FORKS: SHOES-ADJUST (WASH*)		
12. HYDRAULIC CYLINDERS: PACKING-ATTACHMENTS		
13. MAST AND CARRIAGE: ROLLERS-MAST ATTACHMENT		
14. STEER LINKAGE		
15. TIRES		
16. CONTROLLER		
17. CONTRACTORS		
18. RESISTORS*		
19. ELECTRIC MOTORS: BRUSHES-COMMUTATOR-MOUNTING		
20. WHEEL BEARINGS (REPACK*)		
21. THERMAL CUT-OUT SWITCHES		
22. GENERAL INSPECTION AND TIGHTENING (HEAD-MANIFOLD-SUSPENSION)*		

†Use "Remarks" space for any comments. If more space is needed, use the reverse side, indicating the section to which comments apply.

SIGNATURE AND DATE

REMARKS *(Lubrication)*	REMARKS *(Operational Inspection)*	REMARKS *(Inspection and Servicing)*

Figure 1.—Preventive Maintenance Guide.

manner which could cause a breakdown. When breakdowns do occur on the job, the operator must not attempt to repair or move the unit to the maintenance shop since such an action could aggravate any damage present in the equipment. In this case, it is the operator's responsibility to report the incident to his superior for appropriate action.

2.1.3.3 Maintenance Shop Responsibilities. When equipment is brought into the maintenance shop for preventive maintenance service, it should be cleaned and lubricated prior to receiving an inspection by an authorized shop inspector. Upon completion of the preliminary servicing, the inspector assumes the responsibility for performing a thorough inspection of the equipment, including an operational test and service inspection. These procedures, preliminary servicing and inspection, should be accomplished in accordance with the Preventive Maintenance Guide (NAVSUP Form 1377), Figure 1, which authorizes the inspector to make minor adjustments to the equipment. If, however, the inspection indicates major adjustments or repairs, the inspector will prepare a Shop Repair Order (SRO) (NAVFAC 11200/3A) (Figure 2), outlining the required maintenance for the equipment. One copy of the SRO will be filed in the Equipment History Jacket for future reference when updating the Dispatch Control Cards; MHE Gasoline Powered (NAVSUP Form 1377/3), or MHE Electric Powered NAVSUP Form 1377/4. These forms are illustrated in Figures 13 and 14, Chapter 3.

(NAVSUP Form 1377) is designed for use in the materials handling equipment preventive maintenance program. The purpose of dividing the form into three separate sections is to assign responsibility, to provide a record of services performed, and to indicate the specific areas that require servicing. The last two are of special importance as servicing and inspections will be based on individual equipment maintenance history. Reference to available maintenance records and the preceding Guide will restrict services to those required for the specific item. Establishment of this procedure will eliminate the over-servicing that is common when maintenance history is not considered. The definitive maintenance pattern developed from the use of this form will provide improved control of maintenance procedures.

The initial use of the form begins with the acceptance inspection of new equipment. When available, the aid of a representative of the equipment manufacturer should be

SRO NUMBER: 3534 | PM GROUP: | SHOP REPAIR ORDER | JOB ORDER NO.: 970001 | USN REG. NO.: 13-78460

ACTIVITY: NASD-PHILA. | ASSIGNMENT: ✓ | DESCRIPTION: FORK LIFT | MAKE: YALE | MODEL: K-6517-10M | YEAR: 1977

EQUIP. MAINT. CODE: 191 | WORK GEN. CODE: SCHEDULED | LABOR CLASS CODE: | DATE: 12-17-79 | TIME IN: 0800 | DATE: 12-17-79 | TIME OUT: 0945 | MILEAGE OR HOURS OPERATION: 4265

REPAIR CODE	WORK CENTER	HOURS STANDARD	HOURS ACTUAL	OPN. NO.	DESCRIPTION OF WORK	COST LABOR	COST MATERIAL	MECHANIC
					PM SERVICE DUE TYPE: A DATE: 12-17 — LAST PM SERVICES, MILES OR HOURS OPERATION "A": "B": 4176 "C": LUBRICATION:			
30	01	0.5	0.5			2.00	.50	JB
12	10	0.7	0.7		ADJUST BRAKES	2.80	—	JB
30	02	0.5	0.5		LUBRICATE	2.00	—	JB

WORK CENTER CODE SUMMARY	INSPECTOR	DATE	OIL	$	LABOR 1.7 HRS @ $ 4.00	TOTAL $ 6.80
01	J. White	12-17	2 QTS @ 25	.50	MATERIAL-PARTS (MAINT.)	
01	ESTIMATOR D. Black	12-17			MATERIAL (OPERATIONS)	.50
10-02	J. B[illegible]	12-17			SUB-TOTAL	$
	SUPERVISOR [illegible]	12-17	TOTAL OPNS. MIL.	$ .50	OVERHEAD @ %	
					GRAND TOTAL	$ 7.30

NAVFAC 11200/3A (REV. 1-73)
S/N 0105-LF-004-1001

MECHANIC: Bring to the attention of Supervisor any additional work necessary.

Figure 2.—Shop Repair Order.

obtained for this inspection. The observance of features peculiar to the equipment shall be noted on the reverse side of the form for reference in subsequent preventive maintenance inspections. NAVSUP Form 1377 will be prepared in advance of the equipment's scheduled preventive date. Information necessary for preparation will be obtained from review of the preceding NAVSUP Form 1377, Shop Repair Orders, and the Dispatch Control Card. The completed form will filed in conjunction with the related Shop Repair Orders in the Equipment's History Jacket for future use. Retention of forms beyond the immediate preceding one will be at the user's discretion. Personnel performing the services will indicate their completion by inserting the symbol (✓) in the applicable "performed column, and signing in appropriate space. The completion form will be returned with the related Shop Repair Orders to the appropriate personnel for review prior to filing.

Normal service will be indicated by use of the symbol (X) in the Scheduled column. For seasonal and "C" type service the applicable nomenclature will be used: i.e., flush, antifreeze, clean repack, etc. Asterisk annotation indicates items for which service and inspection frequency should be established on equipment history. These items also require service and inspection during "C" type preventive maintenance.

NOTE - Lubrication services will include replacement of defective grease fittings and the reporting of excessive lubricant consumption and any other noticeable indications of defects.

It is the responsibility of the maintenance shop to provide adequate facilities to service all types of equipment and to efficiently handle the work load. Such facilities should include adjustable lifts; lubrication and cleaning equipment; power tools; test equipment; and all types of hand tools necessary to repair or adjust the equipment. It must be emphasized that only the correct tools should be used to make the repairs.

The maintenance shop has the responsibility of maintaining the manufacturers Technical Manuals. These technical manuals provide the manufacturers recommended maintenance procedures, time schedules, lubrication schedules, principles of operation, troubleshooting guide, repair instructions and a myriad of other useful maintenance data relative to the specific unit of MHE. The manuals also contain illustrated parts breakdown of component/assemblies and parts list.

2.1.3.4 Operator and Maintenance Shop Cooperation. The responsibilities of the operator and the maintenance shop overlap in such a manner that close cooperation and communication are fundamental requirements for an efficient preventive maintenance program within

each organization. Information exchanges between the two groups and periodic review of the program, every year at a minimum, can constructively contribute to determining possible revisions in the operations which could increase the overall efficiency of the organization. Close liaison between the two groups will enable each to profit from the knowledge and experience gained by the other in his respective area of responsibility.

2.1.4 New Equipment

New equipment must receive the same type of preliminary servicing and inspection in accordance with NAVSUP Form 1377 mentioned in paragraph 2.1.3.3. After completion of these procedures and the initiation of an Equipment History Jacket, the equipment should be placed in service in accordance with manufacturer's instructions. When it is practicable, the maintenance supervisor should request the manufacturer to send a representative to test and demonstrate new equipment. This service provides current information regarding changes in engineering design and gives operating and maintenance personnel the opportunity to discuss problems encountered in repair and preventive maintenance work.

2.1.5 Quality Deficiency Report

The Quality Deficiency Report (Standard Form 368), see Figure 3, will be used by all activities for reporting unsatisfactory performance of failures attributable to faulty design or material in MHE. The same medium may be used to report inadequacies in the equipment technical manual. Before submitting this report, there must be consideration of the manufacturer's warranty. A standard warranty extends for a period of one year from date of delivery. However, this one year limitation does not apply to latent defects which may later become apparent, causing failure or nonusability of the item well within normal service life expectancy.

2.1.5.1 Conditions for Reporting. A Quality Deficiency Report will be submitted when a deficiency occurs, or recurs, under any of the following circumstances:

1. Deficiency constitutes a hazard to personnel or equipment regardless of the nature or incidence of failures.
2. Deficiency involves general unsatisfactory operation or performance of equipment, including new equipment just placed in operation.
3. Deficiency is due to inadequacy in the design of certain components considered necessary for proper operation, maintenance, or handling of equipment.
4. Deficiency is due to excessive wear and deterioration for the period of time and conditions under which the item was in use or on hand.
5. Deficiency is apparently due to faulty material.
6. Deficiency is due to circumstances other than those indicated above, but is considered to be of sufficient importance to warrant reporting to higher authority.

2.1.5.2 Preparation of Report

2.1.5.2.1 Submission. Separate Quality Deficiency Reports will be submitted in duplicate for each individual deficiency, and for different deficiencies occurring on the same item, to expedite processing of each case. All identical deficiencies on the same item may be consolidated in one report. Sections and spaces on the form which are obviously not applicable to the particular defective item or reporting activity will be marked "NA" (not applicable). It is essential that all of the following information, applicable to the defective item, be furnished on the report to permit accurate analysis of the deficiency and prompt action to correct same.

2.1.5.2.2 Address Blocks. In block 1a, enter the complete mailing address of the originating activity. In block 1b, enter the person who is the point-of-contact and the autovon and commercial telephone number and extension. In block 2a, enter: Commanding Officer, Navy Ships Parts Control Center, Box 2020, Code 0302, Mechanicsburg, PA. 17055.

2.1.5.2.3 "Vehicle Information, blocks 3 through 15". In these blocks, enter the complete identification of the machine, including contract number, nomenclature, manufacturer, manufacturer's serial number and model number, and the Navy registration number plus the balance of data called for. The USN Registration Number of the vehicle should be provided in block 9, along with the manufacturer's serial number.

2.1.5.2.4 "Deficient Item, blocks 16 to 19". In these blocks enter the complete identification of the defective item nomenclature, part or stock number, manufacturer and model/type designation. The defective item is that item which is responsible for the deficiency, not an item which may have failed or been damaged as a result of the deficiency. Further, the item should be retained to insure the warranty coverage, in case the manufacturer requests it for examination with respect to the defect. Activities should not correct defects on equipment during the warranty period without specific written authority from the contracting officer or the MHE engineering function at SPCC. Local manufacturer's representatives are not permitted to accomplish warranty corrections without formal authority from the contractor.

2.1.5.2.5 "Deficiency". Blocks17 through 21 — self-explanatory.

2.1.5.2.6 "Details" Block. Enter here a clear and complete description of the deficiency · circumstances of the occurrence, resultant damage, injury to personnel, probable cause, recommendations for correction and any further remarks which might be helpful to the reviewing authority. Photographs or sketches of the defective item area should be furnished when the written word is inadequate to describe fully the deficiency. When more than one failure has occurred on a specific item, and there are variations in type or magnitude of the fault, the difference(s) should be noted under this heading.

2.1.6 Preventive Maintenance Scheduling

Each activity must establish a preventive maintenance program, appropriate for local operating conditions, which will encompass these four basic factors:

1. A planned program of periodic inspections and maintenance based on actual vehicle or equipment

Carbon paper not required to complete this side.

FRONT

QUALITY DEFICIENCY REPORT
(Category II)

SECTION I

1a. From *(Originating point)*	2a. To *(Screening point)*
1b. Typed Name, Duty Phone and Signature	2b. Typed Name, Duty Phone and Signature

3. Report Control No.	4. Date Deficiency Discovered	5. National Stock No. (NSN)	6. Nomenclature

7. Manufacturer/Mfg. Code/Shipper	8. Mfg. Part No.	9. Serial/Lot/Batch No.	10. Contract/PO/Document No.

11. Item ☐ New ☐ Repaired/ Overhauled	12. Date Manufactured/ Repaired/Overhauled	13. Operating Time at Failure	14. Government Furnished Material ☐ Yes ☐ No

15. Quantity	a. Received	b. Inspected	c. Deficient	d. In Stock

16. Deficient Item Works On/With	a. End Item *(Aircraft, tank, ship, howitzer, etc.)*	(1) Type/Model/Series			(2) Serial No.
	b. Next Higher Assembly	(1) National Stock No. (NSN)	(2) Nomenclature	(3) Part No.	(4) Serial No./Lot No.

17. Dollar Value	18. Est. Correction Cost	19. Item Under Warranty ☐ Yes ☐ No ☐ Unknown	20. Work Unit Code/EIC *(Navy and Air Force only)*

21. Action/Disposition
☐ Holding Exhibit for _____ days ☐ Released for Investigation ☐ Returned to Stock/ Disposed of ☐ Repaired ☐ Other *(Explain in Item 22)*

22. Details *(Describe, to best ability, what is wrong, how and why, circumstances prior to difficulty, description of difficulty, cause, action taken including disposition, recommendations. Identify with related item number. Include and list supporting documents. Continue on separate sheet if necessary.)*

SECTION II

23a. To *(Action Point)*	24a. To *(Support Point) (Use Items 25 and 26 if more than one)*
23b. Typed Name, Duty Phone and Signature	24b. Typed Name, Duty Phone and Signature
25a. To *(Support Point)*	26a. To *(Support Point)*
25b. Typed Name, Duty Phone and Signature	26b. Typed Name, Duty Phone and Signature

368-101

STANDARD FORM 368, April 1974
General Services Administration (FPMR 101-26-7)

Figure 3. — Standard Form 368 — Quality Deficiency Report

BACK

Carbon paper is required — only face of form is chemical treated

SECTION III

27a. From *(Action point)*	28a. To *(Screening point)*
27b. Typed Name, Duty Phone and Signature	28b. Typed Name, Duty Phone and Signature

29. Specification No.	30. Originators Method of Notification
	☐ SF 368 ☐ Msg *(Copy attached)* ☐ Phone Call/Visit

31. Type of Shipment/Purchase

Direct Delivery From Vendor: Other *(Specify)*

☐ Depot ☐ Stock Item ☐ Nonstock Item ☐ Federal Supply Schedule ☐

32. Findings and Recommendations of Investigation. *(Explain in detail. Continue on a separate sheet of paper, if necessary.)*

33. Action Taken

34. Results of Depot Surveillance

35. From *(Screening point)*	36. To *(Originator)*

37. Distribution

Figure 3. — Standard Form 368 — Quality Deficiency Report - Continued

operation as measured by an equipment mounted recorder;

2. A carefully selected maintenance staff with capable supervision;

3. The authority to carry out the program; and,

4. An accurate record keeping system, since it is essential that repair requests and maintenance steps be recorded.

This record must be kept up-to-date for each piece of equipment and must be periodically reviewed for general equipment condition and indications of repetitive malfunctions in the same component.

Based on these principals, equipment with similar utilization patterns will be grouped together for preventive maintenance. The groups will be subject to four different maintenance cycles - A, B, C and D. The actual control of these cycles involves various forms which are detailed in Chapter 3, along with a tabular presentation of the several preventive maintenance schedules.

2.1.7 Equipment History Jacket

An individual history jacket for each piece of powered materials handling equipment will be maintained by the maintenance shop. The information filed will provide a complete history of the service life of the equipment, including hours of operation and maintenance; costs of maintenance and materials; and inspection data available from NAVSUP Form 1377. Operation costs included will be as defined in the NAVCOMPT MANUAL, VOLUME 3. In the event a piece of equipment is transferred, a copy of the Materials Handling Equipment Data (NAVSUP Form 280) will be placed in the equipment history jacket and the jacket will accompany the unit.

2.1.7.1 Modification or Alteration of Equipment. Unauthorized modifications or alterations to equipment will void the manufacturers guaranty. Therefore, no modifications or alterations to any equipment will be performed without specific, detailed authorization from the Ships Parts Control Center. When modification or alteration of any unit of equipment is necessary or advisable, in order to establish greater usefulness or to correct faulty operations, a request for such modifications or alteration will be forwarded to the Ships Parts Control Center, detailing the recommended change or changes and the reasons therefor. A copy of the details of approved modifications will be included in the equipment history jacket.

2.1.8 Equipment Transfer

At the time the equipment is transferred, the applicable Dispatch Control Card (NAVSUP Form 1377/3) or NAVSUP Form 1377/4), see figures 13 and 14, Chapter 3, must be brought up-to-date and must be included in the equipment history jacket. A copy of the equipment technical manual and any other pertinent data or forms, will also be included in this jacket upon equipment transfer.

2.1.9 Equipment Replacement

Equipment will be replaced when old equipment is retired due to economical considerations, age, wear, or severe accidental damage. Refer to SPCC Instruction 10490.1B for procedures for replacement.

2.1.9.1 Retirement. The procedures described herein will establish, within the Department of the Navy, a uniform and economical program for the retirement of materials handling equipment (fig. 4). These procedures are required to avoid undue expenditures in the repair of equipment which could be more economically replaced.

2.1.9.2 Repair Expenditures. When a piece of equipment requires repair which exceeds the one-time, or accumulated repair limit, no further maintenance expenditure is authorized. Normally, such repairs will retire the equipment from use. However, retirement will not be effected if:

1. The required repairs exceed the maximum cumulative limit but will extend the life of the equipment for a period commensurate with the expenditure required;

2. The item is beyond the maximum utilization years of economical use as shown in figure 4, but any one-time repair cost does not exceed 10 percent of the replacement cost, and the maximum cumulative repair limit is not exceeded, except as provided above.

All inspections and repairs performed on equipment will be included in the repair expenditure limits. Expenditures not to be included in the expenditure limits are: Operating costs such as expenditures for fuels, lubricants, battery charging, installation of markings, washing, antifreeze, replacement tires, replacement batteries for electric-powered MHE, etc.

Upon reaching the maximum age of utilization, an item of materials handling equipment may be considered, for planning purposes, eligible for retirement. However, when the equipment has remaining operational and economical life, based on past records which show it is reliable, has not required excessive repairs, and is in good condition, it may be kept operational after making adjustments for past retirement experience and the general age and condition of the equipment inventory.

2.1.10 Safety Requirements

2.1.10.1 The American National Standard Institute (ANSI). Specific safety standards for the construction of various types of powered industrial trucks are published by the Underwriters Laboratories, Inc. (UL) 207 East Ohio Street, Chicago, Illinois 60611. Safety Standards for Powered Industrial trucks have been divided in separate volumes:

B56.1 Fork Lift and High Lift Trucks.

B56.2 Powered Industrial Trucks, Type Designations, Areas of Use, Maintenance and Operation.

B56.3 Electric-Battery-Powered Industrial Trucks, Standard for Safety (covers types E, EE and EX).

B56.4 Internal Combustion Engine-Powered Indus-

trial Trucks, Standard for Safety (covers types G, GS, D and DS).

2.1.10.2 Personnel Protection. It is necessary for personnel protection that all safety features show no damage or deterioration which could cause a hazard to safe equipment operation. Further, each type of equipment has particular areas which require safety inspections. Therefore, for internal combustion engines, periodic inspection is necessary to determine if any hazards are apparent such as:

1. Leaks from fuel tanks, fuel lines, fuel pumps, and carburetors.
2. Improper operation of electrical system components.
3. Muffler and exhaust pipe malfunction.
4. Improper operation of brakes, horn and lights.
5. Damaged windshield, reflectors and mirrors.

For electric powered equipment, periodic inspection is necessary to determine:

1. Condition of the battery and battery connections.
2. Proper operation of brakes, lights and horn.

In addition to these safety inspections, the floor or the working areas must be free of oil or gasoline spots which could cause accidents due to skidding; fire doors, extinguishers, and alarms must not be blocked, and appropriate safety equipment must be worn, including eye and foot protection. Detailed safety requirements and procedures are contained in NAVMAT P-5100, Safety Precautions for Shore Activities, and DoD Regulation 4145.19R-1, Storage and Materials Handling.

2.1.10.3 Safety Devices. Overhead guards are provided for protection from falling objects and they should not be removed. Exceptions by special permission from the Safety Officer are permitted only when the overhead guard either increases the overall height of the equipment so it cannot be used in the specific operation, or prevents freedom of movement of the operator.

2.1.10.4 Grounding of Vehicle. Type EX Class 1 Group D trucks shall have at least two tires and wheels constructed of electrically conductive material. Type EE trucks have at least two tires and wheels constructed of electrically conductive material or shall be provided with some other equivalent static discharge device, such as an electrically conductive ground strap. The use of electrically conductive ground straps in lieu of conductive tires is not permitted on EX rated forklifts. Conductive tires are marked "SC" or Static Conductive and may also have a UL label. The approved method for measuring the resistance of static discharge is given in the latest revision of MIL-T-21869 Trucks, Lift, Fork, Electric; General Specification for.

trial Trucks, Standard for Safety (covers types G, GS, D and DS).

2.1.10.2 Personnel Protection. It is necessary for personnel protection that all safety features show no damage or deterioration which could cause a hazard to safe equipment operation. Further, each type of equipment has particular areas which require safety inspections. Therefore, for internal combustion engines, periodic inspection is necessary to determine if any hazards are apparent such as:

1. Leaks from fuel tanks, fuel lines, fuel pumps, and carburetors.
2. Improper operation of electrical system components.
3. Muffler and exhaust pipe malfunction.
4. Improper operation of brakes, horn and lights.
5. Damaged windshield, reflectors and mirrors.

For electric powered equipment, periodic inspection is necessary to determine:

1. Condition of the battery and battery connections.
2. Proper operation of brakes, lights and horn.

In addition to these safety inspections, the floor or the working areas must be free of oil or gasoline spots which could cause accidents due to skidding; fire doors, extinguishers, and alarms must not be blocked, and appropriate safety equipment must be worn, including eye and foot protection. Detailed safety requirements and procedures are contained in NAVMAT P-5100, Safety Precautions for Shore Activities, and DoD Regulation 4145.19R-1, Storage and Materials Handling.

2.1.10.3 Safety Devices. Overhead guards are provided for protection from falling objects and they should not be removed. Exceptions by special permission from the Safety Officer are permitted only when the overhead guard either increases the overall height of the equipment so it cannot be used in the specific operation, or prevents freedom of movement of the operator.

2.1.10.4 Grounding of Vehicle. Type EX Class I Group D trucks shall have at least two tires and wheels constructed of electrically conductive material. Type EE trucks have at least two tires and wheels constructed of electrically conductive material or shall be provided with some other equivalent static discharge device, such as an electrically conductive ground strap. The use of electrically conductive ground straps in lieu of conductive tires is not permitted on EX rated forklifts. Conductive tires are marked "SC" or Static Conductive and may also have a UL label. The approved method for measuring the resistance of static discharge is given in the latest revision of MIL-T-21869 Trucks, Lift, Fork, Electric; General Specification for.

TABLE I – REPAIR LIMITS & LIFE EXPECTANCIES FOR MATERIALS HANDLING EQUIPMENT (SHOREBASED)

Type of Equipment	Maximum Economical Utilization		Maximum Cumulative Repair Limit % of Replacement Cost *	Maximum Allowable "One-Time Repair Limits" % of Replacement Costs Hours in Use (In Hundreds)														
	Yrs.	Hrs.		12	24	36	48	60	72	84	96	108	120	132	144	156	168	180
Fork Truck, Gas/Diesel, 2000# to 6000#	8	9,600	100	50	45	40	35	25	20	15	10	–	–	–	–	–	–	–
Fork Truck, Gas/Diesel, 7500# to 15,000#	10	12,000	100	50	45	40	35	30	25	20	15	10	10	–	–	–	–	–
Tractor, Gas/Diesel	8	9,600	100	50	45	40	35	25	20	15	10	–	–	–	–	–	–	–
Crane, Gas/Diesel	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	–	–	–
Platform Truck, Gas/Diesel	8	9,600	100	50	45	40	35	25	20	15	10	–	–	–	–	–	–	–
Truck, Straddle-carry, Gas/Diesel	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Fork Truck, Electric 2000# to 6000#	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Tractor, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Crane, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Platform Truck, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10
Pallet Truck, Electric	15	18,000	100	50	50	50	45	45	45	40	40	35	35	30	25	20	15	10

TABLE II – REPAIR LIMITS AND LIFE EXPECTANCIES FOR MATERIALS HANDLING EQUIPMENT (SHIPBOARD)

Cost Code	Type of Equipment	Maximum Economical Utilization		Maximum Cumulative Repair Limit % of Replacement Cost *	Maximum Allowable "One-Time Repair Limits" % of Replacement Costs Hours in Use (In Hundreds)												
		Yrs.	Hrs.		12	24	36	48	60	72	84	96	108	120	132	144	156
1370	Fork Truck, Electric, "EE", 4000# to 6000#	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	–
1380	Fork Truck, Electric, "EX", 4000# to 6000#	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	–
1390	Reach & Tier, Electric, "EE", 4000#	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	–
1610	Pallet Truck, Electric, "EE", 6000#, Walkie	12	14,400	100	50	50	45	45	40	40	35	30	25	20	15	10	–
1350	Fork Truck, Diesel, Solid Rubber Tires, 6000#	7	8,400	100	50	45	40	35	25	15	10	–	–	–	–	–	–
1330	Fork Truck, Diesel, Pneu. Rubber Tires, 6000#	8	9,600	100	50	45	40	35	25	20	15	10	–	–	–	–	–
1340	Fork Truck, Diesel, Pneu. Rubber Tires, 15,000#	9	10,800	100	50	45	40	35	30	25	20	15	10	–	–	–	–
1340	Fork Truck, Diesel, Pneu. Rubber Tires, 20,000#	9	10,800	100	50	45	40	35	30	25	20	15	10	–	–	–	–
1820	Fork Truck, Diesel, Rough Terrain, 6000#	8	9,600	100	50	45	40	35	25	20	15	10	–	–	–	–	–

*Under unusual circumstances the maximum cumulative repair limit may be extended provided the additional cost of repairs will extend the remaining life expectancy of the equipment. Current replacement costs will be provided as enclosures to the MHE annual report letters.

Data on this chart are intended as a guide for procurement and budget planning.

NOTE: Cost of Replacement Batteries for Electric-Powered MHE will not be considered part of the repair costs.

Figure 4. – Repair Limits and Life Expectancies for Materials Handling Equipment

2.1.10.5 Safety Color Code. MHE used for handling ammunition and explosives shall be safety color coded to indicate its unique characteristics for handling hazardous materials. Finish color shall be yellow No. 15102. The diagonal stripe shall be blue No. 15102. The designated type (EE, EX) shall be painted in four inch block letters on both sides and rear of the equipment.

2.1.10.6 NAVSEA OP 4098. Additional safety requirements are delineated in NAVSEA OP 4098 and are to be observed when handling explosives/hazardous material.

2.1.11 Maintaining Safety Integrity of MHE

2.1.11.1 Adherance to the recommendations, service notes, and maintenance procedures contained in the applicable manufacturers technical manuals will maximize personnel safety and equipment efficiency during material-handling operations. To maintain the integrity of MHE, the following precautions shall be observed by maintenance personnel concerned with servicing and repairing industrial MHE.

1. All repairs shall be made only by authorized, trained personnel.
2. Repairs to MHE shall not be conducted in buildings containing ammunition or explosives or in Class I or Class II hazardous locations.
3. Worn or damaged parts of MHE shall be replaced only by parts equivalent in functional safety to those used in the original design.
4. Validation of repaired or replaced parts shall be accomplished by the PWC in order to maintain the integrity of the original equipment classification (i.e., EE or EX designation). Statement of validation should be provided to commands to which the MHE is assigned.

2.1.12 Prolonged Storage

2.1.12.1 Recommendations for Keeping MHE Operational During Prolonged Storage.

1. Coat electrical panel with corrosion preventive compound meeting the requirements of Military Specification MIL-C-16173, or equal compound.
2. Use vaseline or equal compound, on all bolted and bayonet type electrical connections.
3. Block up trucks so drive and load wheels are off the floor to prevent flat spots on the wheels.
4. Plug battery into the truck and run trucks (on the blocks) for a few minutes. Operate travel controller forward and reverse through entire speed ranges. Operate lift/lower control over entire range. Operate reach, tilt and side shift (if applicable) several times.

Lubricate exposed piston areas with a thin coat of light grease after cycling is complete.

Cycle described above should be conducted at least every 3 months.

5. Semi-annually the electrical compartment cover should be removed and the electrical panel and its components inspected. Any areas where evidence of corrosion exists should be cleaned and the entire panel coated as in step 1 above.
6. Trucks should not be wrapped with plastic when in the storage building as this tends to accumulate moisture on the inside of the plastic and on the truck.

SECTION 2—SERVICING

2.2.1 Purpose

The purpose of this section is to discuss preventive maintenance procedures that are applicable to materials handling equipment. Section 3 of NAVFAC P-300, Management of Transportation Equipment provides specific schedules and requirements for crane maintenance, inspection and testing.

2.2.2 Scope

This section covers the preventive maintenance processes that apply to gasoline, diesel and electric powered equipments and their components.

2.2.3 Facilities and Equipment Used in Servicing

2.2.3.1 Servicing Facilities. Adequate servicing facilities to perform proper preventive maintenance must be provided in accordance with the requirements of and the equipment employed by the using organization.

2.2.3.2 Servicing Equipment. The materials required for proper servicing of materials handling equipment must include a lift, or a pit if a lift is not available; an overhead hoist; lubrication equipment; battery charging equipment; cleaning equipment; air compressor; hand tools; portable hydraulic jacks; power tools; and any supporting equipment necessary to complete equipment repairs.

2.2.4 Service and Inspection

Inspection on all powered materials handling equipment must be performed in the maintenance shop under the direction of the shop supervisor.

2.2.4.1 Preliminary Cleaning. Dirt, grit, or other foreign matter which accumulates on equipment must be removed prior to equipment lubrication and inspection. There are several commercial cleaning compounds which, when applied following the directions pertinent to the equipment being cleaned (gas, diesel, or electric powered), are satisfactory for cleaning. Since many of these compounds exhibit toxic characteristics, personnel should wear face shields or goggles and impenetrable gloves,

boots, aprons, coats, or pants. Prior to this cleaning, any exposed components that could be damaged by the solvent should be adequately covered for protection.

2.2.4.2 Lubrication. After cleaning, and prior to inspection, the equipment should be lubricated in accordance with the procedures outlined on the Preventive Maintenance Guide (NAVSUP Form 1377), (Figure 1). A specific lubrication chart for each equipment will be found in the Technical Manual for that make and model. The manual must be readily available to the mechanic, to supplement the NAVSUP Form 1377. The lubricants used in this procedure should be those recommended by the manufacturer, or equal. Further, the lubrication area must be equipped with an electric or hydraulic lift, or a pit; and the mechanic must have ready access to a high pressure grease gun.

2.2.4.3 Inspection. Inspection of the equipment, after completing the cleaning and lubrication processes, must be conducted in accordance with NAVSUP Form 1377. This procedure is composed of two parts; an operation inspection and a service inspection.

2.2.4.3.1 Operational Inspection. This procedure requires that the equipment be test driven to observe any equipment malfunctions. When defects are noted, the appropriate column on NAVSUP Form 1377 will be checked for reference. The inspector will exercise his judgment in determining when a condition is due to normal usage which does not sufficiently impair the operation to warrant immediate correction. The components checked in this inspection include:

1. Instruments
2. Brakes (service and parking)
3. Clutch
4. Inching control
5. Steering
6. Transmission (speed ranges and controls)
7. Hydraulic controls
8. Safety features

2.2.4.3.2 Service Inspection. The extent of services performed by the inspector will be restricted to minor adjustments. Exceptions due to individual facilities, personnel structure or the need for specialized training may be required in some instances. Components included in the minor adjustment category are:

1. Vee Belts
*2. Spark plugs
3. Distributor timing
4. Carburetor adjustment
5. Tires (inflation, damage, abnormal wear)
*6. Steering assembly

*Servicing of these items will be determined from Dispatch Control Card and NAVSUP Form 1377.

2.2.5 Maintenance of Powered Equipment

The three types of powered equipment which require preventive maintenance are:

1. Gasoline powered
2. Diesel powered
3. Electric powered

Each of these types has specific components, not present on the others, which necessitate separate discussions. However, there are many components common to each type — steering mechanism, brakes, wheel bearings, etc. — that should be discussed under the general headings mentioned here because the requirements for preventive maintenance are generally the same.

2.2.5.1 Transmission. Transmissions used in material handling equipment include three main classes. These are:

1. Standard (conventional manual operation of clutch and shift lever).
2. Automatic (torque converter type).
3. Fluid drive (fluid coupling with manually shifted transmission).

Preventive maintenance for these types of transmissions is best accomplished by adherence to the inspection procedures outlined in the equipment technical manual. Each should be regularly inspected for oil leaks; proper lubricant level; evidence of dirt or metal chip contamination in the oil; evidence of high operating temperatures denoted by lubricant discoloration or strong odor; insecure or clogged vents; clogged filters, screens, and strainers; unusual noises, which will necessitate further inspection to determine cause; any significant change in the transmission operation; and proper adjustment in the instance of automatic transmissions.

2.2.5.2. Clutch. A clutch malfunction can normally be determined only while the equipment is in operation. Therefore, operators should notice the presence of these indications of clutch malfunction.

1. Insufficient free-play in the clutch pedal which is based on the normal free-play indicated in the equipment technical manual.
2. Clutch slippage under load.
3. Clutch drag during disengagement, or chatter during engagement.
4. Any significant change in clutch operation during equipment use.

When equipment is brought into the shop for major clutch repair, there should be an inspection of all clutch components - disc, pressure plate, throw-out bearing, etc. to preclude future failures.

2.2.5.3 Propeller Shaft and Universal Joints. The beginning of malfunction with respect to these components will be indicated by excessive vibration and backlash during the operation of the unit. Examples of the probable cause for excessive vibration are:

1. Improper drive line angles.
2. Propeller shaft out-of-balance and/or bent.
3. Worn universal joints.
4. Worn universal joint yoke bearings.

Excessive backlash would be caused by worn universal joints, worn propeller shaft or joint splines, or improper adjustment in differential.

2.2.5.4 Drive Belts and Pulleys. On belt driven units, the belt(s) must be checked for tension, excessive wear, and in the case of multiples, for matching as to condition, size and length. The pulley(s) must not be misaligned.

2.2.5.5. Drive Axle. The drive axle normally consists of an axle housing, a differential carrier assembly, the

axles and wheels and, in some units, hub reduction gears. Power transfer to the drive axles is accomplished by gears. Symptoms of component malfunctions are:

1. Excessive backlash in drive train.
2. Axle noisy on drive, coast, or both drive and coast (amount of noise necessary to be indicative of a malfunction depends upon inherent noise of the system due to its size and function).
3. Lubricant leakage.

Causes of these malfunctions, which may be found in the various components of the assembly are:

1. Loose wheel bolts.

2. Improperly adjusted wheel bearings.
3. Worn or damaged differential gears.
4. Defective bearings.
5. Improper adjustment of pinion, carrier, or axle bearings.

These causes are just a few examples of those which could cause drive axle malfunction. For other causes, the equipment technical manual should be consulted where also will be found the necessary instructions for repairing or adjustint the faulty component.

2.2.5.6 Wheels and Wheel Bearings. Proper wheel bearing adjustment is vital to the life of the bearings and the lubricant retainer seals. If the bearings are loose in adjustment they will become damaged and the lubricant retainer seals cannot seat properly. If the bearings are tight in adjustment, they will also be damaged during operation. Therefore, periodic inspection of the bearings is necessary to determine that they remain properly adjusted.

Other indications of possible malfunction may be best determined by periodically removing the wheels and inspecting the bearings and oil seals. After disassembly of all related components, thoroughly clean, dry, and inspect the rollers, balls races, and cages for any indication of damage such as pitting, burning, etc.

CAUTION – After cleaning, if using compressed air hose for drying, do not spin roller bearing since spinning could cause severe damage. When reassembling and adjusting the components, follow the manufacturer's specifications.

2.2.5.7 Industrial Tires. The two types of industrial tires used on MHE are pneumatic and solid – the latter being available in different materials or compositions. These tires must be inspected for abnormal wear which could be indicative of improper operation in steering mechanism, misalinement or equipment mishandling. Conditions to be avoided are:

1. Improper axle or steering alinement.
2. Improper or unequal air pressure in pneumatic tires.
3. Contact with oil, grease, gasoline, or acids.
4. Overloading
5. Undersized tires.
6. Excessive heat.
7. Sharp turns, quick starts and stops, and spinning of wheels.

The solid drive tires should be replaced, in pairs, when flat spots appear, or when damaged by objects such as metal splinters, grease, acids, or nails. Pneumatic tires must be replaced, or repaired if applicable, when surfaces become worn, or sidewalls are damaged to the extent of becoming hazardous to the operating personnel.

2.2.5.8 Brakes. Brake systems on MHE must be inspected to determine whether or not they are functioning properly. Symptoms of brake malfunction are:

1. Spongy pedal (air in lines).
2. Drag in one or all brakes.
3. Excessive pedal travel.
4. Brake pedal gradually travels to floor when brakes are applied.
5. Brake fluid leaks at wheel cylinders or master cylinders.
6. Brake grab (indication of hydraulic fluid leakage on brake linings).
7. Excessive pedal pressure required to apply brakes.
8. "Dead Man" brake malfunction.

2.2.5.9 Steering Mechanism. The steering gear box should be inspected for proper lubricant level and secureness of mounting nuts. When the steering gear box mounting bolts require tightening, the steering column bracket must be loosened to prevent column distortion. Other indications of malfunction in the steering mechanism are:

1. Excessive or insufficient steering wheel free play.
2. Bent or misalined steering shaft.
3. Pitman arm insecurely mounted.
4. Bent drag link.
5. Loose tie rod ends.
6. Worn king pins or bushings.

2.2.5.10 Hydraulic Lift System Maintenance. The hydraulic lift system consists of an oil supply tank, a pump, flow control, valve, single acting lift cylinder, double acting lift cylinder, and a mast and carriage assembly. Since the operation of this system depends upon an internal pressure transfer from the piston through the oil medium to the lifting component, the pressure must be kept constant to maintain operating capability.

The operator should be able to quickly detect abnormal operation of the system in order to correct the deficiency before it develops into a major defect. Indications of abnormal operation are:

1. Lift will not raise load.
2. Lift raises load too slowly.
3. Load is not held in raised position, creeps down slowly.
4. Lift operates unevenly.
5. Mast tilts too slowly.

2.2.5.10.1 Lift Fails to Raise Load. If the lift fails to raise the load, an inspection should be made to determine:

1. That the load weight does not exceed the rated capacity of the equipment.
2. If the lift chain is broken. Check for broken chains when the lift cylinder plunger and crosshead rise but the carriage remains stationary.
3. That the oil tank outlet is not clogged. Drain and inspect for obstructions.
4. If the relief valve is sticking open. Remove relief valve to inspect for dirt or other foreign substance that could cause the valve to stick.
5. If the pump is operating properly. Check by removing the tank cap and operating the lift control lever. When there is no surging action of the oil, the pump is not working.
6. If the lift cylinder is damaged. Inspect the outer case of the lift cylinder for dents or other damage that would interfere with plunger movement.

2.2.5.10.2 Load Is Raised Too Slowly. When the lift raises the load, but the lifting speed is less than 80% of rated performance, the inspection should determine:

1. If the mast and carriage assembly are misalined.
2. If the rollers have shifted.
3. That the hydraulic system oil pressure is correct.
4. That the oil tank outlet is not clogged.
5. If the relief valve is defective.
6. If the hydraulic pump is operating properly.

2.2.5.10.3 Load Creeps Down Slowly. If the lift mechanism does not hold the load in the raised position, the hydraulic system may be leaking and/or the check valves may be partially closed. Inspect the oil lines, fittings, and cylinder packing for leakage. Repair the leaky connections and repack the cylinder if necessary. Remove the check valve to inspect for dirt or any other foreign matter that may cause the valve to stick.

2.2.5.10.4 Uneven Lift Operation. Uneven lift operation is an indication of air in the system and/or binding of the mechanical components. The carriage should be inspected for evidence of dents or other damage that could cause binding. Also, the line fittings and connections should be inspected for leaks since air can enter the system through leaks in the intake line.

2.2.5.10.5 Mast Tilts Slowly. If the mast tilts too slowly, the tilt cylinder piston cups or packing may be leaking; there may be a restriction in the lines or fittings; or the pump may be worn. (Check for a malfunctioning pump and clogged components as outlined in the previous sections).

To inspect for piston cup or packing leakage, tilt the mast to the extreme forward tilt position and disconnect the hose at the tilt cylinder connection. With the control lever in the forward tilt position, check for oil flow through the disconnected end. If oil flows out, the piston leather cups or packing are leaking and should be replaced.

2.2.6 Maintenance of Equipment Powered by Internal Combustion Engines

Preventive maintenance procedures for gasoline and diesel powered equipment primarily consist of inspections applies to the various associated systems which compose the complete engine assembly. These systems are:

1. Mechanical
2. Cooling
3. Fuel
4. Lubrication
5. Electrical

Due to the similarity in the mechanical, lubrication, and cooling systems of these engines, only one discussion pertinent to preventive maintenance for these systems is included in this section with exceptions for each engine noted as applicable. The fuel and electrical systems, however, differ to the extent that they require separate detailed discussions. When defects are observed during inspection, which cannot be corrected by minor adjustments, the equipment should be removed from service until it is made operable in accordance with the equipment technical manual.

2.2.6.1 Mechanical Assembly. The components that should be inspected in this assembly are:

1. Externally – cylinder head, intake and exhaust manifolds, oil pan, valve cover if applicable, breathers, and all associated studs, capscrews, bolts and gaskets.
2. Internally – valves, rocker arms, tappets, springs, and oil pump.

The preventive maintenance procedures for these components are discussed in the following sections.

2.2.6.1.1 Cylinder Head. Unless the inspection of the cylinder head indicates definite looseness or leakage, it should not be tightened. If tightening is deemed necessary, use a torque-indicating wrench and tighten in the sequence and to the torque specified in the equipment technical manual. When a new head gasket is installed, tighten the cylinder head three times, in the manner indicated above, as follows: first, upon installation; second, after engine has warmed; and third, after completing 50 operating hours. On the valve-in-head engines, it will be necessary to check and adjust the valve tappet clearances after the final tightening of the head bolts.

2.2.6.1.2 Intake and Exhaust Manifolds. On both engines, inspect the exhaust manifolds to see that they are secure; that the gaskets are not leading; and that the exhaust pipe flange nuts are tight. When inspecting gasoline engines, also determine that the intake manifold is secure and not showing evidence of leakage; and that the gasket flange nuts are tight. When the gasoline engine intake manifold has an automatic heat-control valve, determine that the bimetal control spring is functioning and is securely connected to the heat-control valve shaft and mounting; that the shaft operates freely; and that the spring properly controls the shaft and valve.

Diesel engine intake will be discussed in the sections outlining preventive maintenance for fuel systems.

2.2.6.1.3 Oil Pan. The oil pan should be inspected for cracks, dents, and oil leakage both from the pan and around the oil pan gasket. If a dent or crack is observed in the pan near the internal location of the oil pump, the pan should be removed and the suction screens, oil lines, and pump inspected for any damage that could be the result of the external dent or crack. When replacing the pan, always install a new oil pan gasket.

2.2.6.1.4 Breathers. The breathers should be inspected to determine that they are clean, open, lubricated, and properly functioning. This inspection is mandatory in accordance with the preventive maintenance lubrication requirements.

2.2.6.1.5 Valves. The valve assembly should be inspected to determine that the valve tappets, rocker arms, shafts, and springs are freely operating; that lubrication is properly delivered; and that the tappet clearances are in accordance with the equipment technical manual. If tappet clearance adjustment is indicated, follow the specifications of the unit under consideration. When replacing the valve cover, always replace the valve cover gasket to preclude future leakage.

2.2.6.2 Cooling System. The cooling system must be inspected to determine whether the system is functioning properly; that there is no leakage; and that the coolant and system components are clean so that maximum flow will occur with corresponding optimum heat exchange. The components needing inspection are:

1. Radiator.
2. Hose and hose connections.
3. Water pump.
4. Fan and fan belts.

2.2.6.2.1 Radiator. Periodic radiator inspection is necessary to assure that there is free air circulation through the core air passages which will assure that heat transfer is unaffected by foreigh material such as dirt, bugs, etc.; to locate the presence of any leaks or cracks; to determine proper coolant level; to test that antifreeze solution is adequate for operational environment; and to determine if the coolant is

contaminated with rust particles or oil. Evidence of an oil slick indicates internal engine defects such as defective head gasket, and will necessitate further inspection to determine source of the trouble. The radiator pressure cap gasket and spring must not show evidence of deterioration or damage that could allow coolant evaporation during operation, or coolant loss through surging through the overflow of the radiator after the engine has been shut off. The pressure in the system which is controlled by the pressure cap must be as stated in the equipment technical manual.

2.2.6.2.2 Hoses and Hose Connections. Coolant system hoses must be regularly inspected for evidence of cracks, leaks, worn areas at the angle bends, and faulty connections.

2.2.6.2.3 Water Pump. Inspection of the water pump is required periodically to determine evidence of any coolant leaks around the pump; evidence of a misalignment in the shaft; and evidence of worn bearings. Where the water pump is driven by the fan belt, the latter must be inspected to determine if there is excess slack which could cause slippage on the pump pulley. The belt must show no evidence of fraying, excessive wear, or deterioration that could adversely effect pump operation. In addition, the fan blades must not be bent or cracked. When the pump is equipped with a packing gland, the packing nut must not be excessively tightened. If the nut is too tight, the shaft could be scored, resulting in coolant leakage.

Do not over tighten fan belt as this overloads pump and generator bearings. Consult equipment manual for proper adjustment.

2.2.6.2.4 Engine Thermostat. When there is any deviation in the normal operating temperature of the equipment, either the engine overheats or fails to reach normal operating temperature, and the cooling system does not show evidence of malfunction, the engine thermostat must be inspected for proper operation. Since this inspection requires a partial disassembly of the cooling system, the equipment should be scheduled for shop maintenance.

2.2.6.3 Fuel System. Gasoline and diesel fuel systems have different components and design, so are treated under separate heading in the following text.

2.2.6.3.1 Gasoline Engine Fuel System. Gasoline fuel system components — tank, pump, fuel lines, filters, carburetor, governor, and air cleaner — should be regularly inspected to determine malfunctions or defects before such deficiencies cause major repairs.

2.2.6.3.1.1. Fuel Tank. The fuel tank must be securely mounted and show no evidence of leakage, cracks, or dents. Periodically, the tank drain plug should be removed to drain the accumulated water and sediment from the tank. The tank safety cap must securely fit the filler neck; the gasket must not be damaged or broken; and filler cap vent hole must be open.

2.2.6.3.1.2. Fuel Lines and Fittings. Fuel lines and fittings must be regularly inspected to determine that they are securely mounted, not leaking, and not rubbing on other components.

2.2.6.3.1.3 Fuel Pump. Fuel pump inspection must be thorough with respect to leakage, proper pump pressures, and cleanliness of filter screens and valves. Pump pressure, easily noted by use of a fuel pressure gauge, must be within the range of the specified limits required by the equipment technical manual.

When the pump is cleaned or rebuilt, all gaskets must be replaced and the pump pressure checked in the manner mentioned above.

2.2.6.3.1.4 Fuel Filter. The fuel filter should be inspected for accumulations of water or dirt which would restrict the flow of fuel. When the filter is the cartridge type, the entire cartridge is replaced when it is damaged or clogged. If the filter uses such material as copper discs or impregnated fibre discs, these components may be cleaned and reinstalled if practicable, or they may be replaced in the case of excessive damage. During filter reassembly, a new gasket must be used between the bowl and the body of the unit to preclude leakage.

If the top of the filter is a die casting, it should be inspected for warpage and, if found to be warped, a complete replacement unit should be installed.

CAUTION – When inspecting fuel filters always close the fuel shut-off valve.

2.2.6.3.1.5 Carburetor. The carburetor should be inspected for external evidence of improper operation. Symptoms of malfunction are:

1. Insecure mounting (indicated by leakage around gaskets).
2. Flooding or starving (malfunctioning control linkage).
3. Improper operating governor (operation should be checked with tachometer).

If these symptoms are not inevidence, but the engine does not operate properly, carburetor repair or adjustment should not be attempted until it is known that all components affecting engine ignition and compression are properly functioning. When theignition and compression are satisfactory and the above external symptoms of carburetor malfunction are not observed, but the equipment still malfunctions, it should be removed from service for a more detailed inspection of the carburetor internal components.

2.2.6.3.1.6 Governor. The governor should be tested to determine whether it is adjusted to limit the maximum speed of the engine not to exceed 200 percent of RPM at maximum rated torque (corrected to standards of 59° F. (15° C.), 0.4 inch of mercury vapor pressure, and 760 mm. of mercury atmospheric pressure). The governed speed of the engine shall limit the maximum speed of the vehicle as required in the equipment manual.

2.2.6.3.1.7 Air Cleaner. Prior to inspection, the air cleaner shall be cleaned and lubricated in accordance with NAVSUP Form 1377 (par. 2.1.3.3). After lubrication, the inspector will determine the condition of the gaskets, clamps, and connecting hoses. These components must be replaced if there are any defects which adversely affect the efficient operation of the cleaner. The oil reservoir should be periodically cleaned and the proper, clean oil added to the indicated level in accordance with NAVSUP Form 1377. When the cleaner is equipped with an exterior air baffle, the baffle must be mounted so it is correctly aligned with the air stream from the fan.

2.2.6.3.2 Diesel Engine Fuel System. In the diesel engine, the components which require special attention, and for which the preventive maintenance procedures are different than those noted for the gasoline engine, are the fuel injection assembly and the fuel filter. It is emphasized that the fuel oil is kept clean at all times since contaminated fuel will foul the pump jets and nozzles, and reduce engine efficiency.

2.2.6.3.2.1 Fuel Injection System. The best preventive maintenance that can be applied to this system is that of strict adherence to the standards outlined in the equipment operation manual. Although age and normal wear will eventually affect operation, adherence to these standards lessens the chance of premature breakdown and can prevent failures caused by:

1. Contaminated or improper fuel.
2. Leaking fuel lines and check valves.
3. Engine overheating.
4. Improper setting of governor control lever.
5. Loose injector nozzles and improper fuel line connections to nozzles.
6. Defective cylinder delivery valve assemblies.
7. Defective fuel supply pump.
8. Dirty fuel filter.
9. Improper pump housing lubricant level.
10. Improper timing of injection pump with respect to camshaft and crankshaft.

When a failure occurs and these components have been inspected and found to exhibit proper operating characteristics, the internal mechanism of this system must be inspected. Because the internal inspection requires at least the removal of the inspection cover and necessitates a detailed inspection for any defects, the unit should be removed from service until it is made operable in accordance with the equipment technical manual.

2.2.6.3.2.2 Compression. Compression of the air in a diesel engine occurs in a combustion chamber located above and at one side of the cylinder bore; in a depression located within the piston depending upon the engine in use. When preliminary inspection indicates the trouble is within the engine, the unit should be scheduled for the repair shop for an internal head and block inspection which requires head removal.

Examples of test equipment used for checking the fuel injection and compression system are shown in figures 5 and 6.

2.2.6.4 Lubrication System. Internal lubrication of the gasoline and diesel engines is accomplished by a geared pressure pump.

During equipment operation, if the oil pressure gauge indicates a pressure other than the normal pressure, the system should be inspected to determine the cause of malfunction. In most cases, loss of pressure is not caused by a defective pump, but by excessive clearance in the bearings of the engine. However, the gear teeth and the gear ends and housing of the pump may wear causing low operating pressure. Therefore, the pump, including the oil pressure regulating valve, should be inspected and tested in accordance with the equipment technical manual. If these components are operating correctly and there is no leakage in the lines or line connections, a more detailed inspection of the engine is required to determine the cause of abnormal pressure.

2.2.6.5 Gasoline Engine Electrical System. The gasoline engine main electrical system, as opposed to the electrically operated accessories such as lights, heater, horn, etc., consists of the battery, starting motor, distributor, coil, generator, all connecting wires, spark plugs, and voltage regulator.

2.2.6.5.1 Battery. Battery preventive maintenance includes inspection of the battery, battery holder, cables, connections, and electrolyte level. The inspection procedure will be sufficient to determine if there are:

1. Cracks or leaks in the battery case.
2. Corrosion, or evidence of damage to the cables, terminals, bolts, posts, straps, and hold-down straps.
3. Loose cables or insecure mounting of battery.
4. Low or uneven levels of electrolyte in the battery cells.

These defects must be corrected if possible, or the components must be replaced when repair is not advisable.

The electrolyte should be checked to determine that the specific gravity is at the correct level. As a minimum consideration, this reading must not be below 1.265 at corrected temperature of 77°F. (25°C.). When the specific gravity is below this minimum level, the battery must be recharged or replaced depending upon its length of service and previous history with respect to recharging.

The electrolyte level, brought to the proper height by adding distilled or clean water, must be at least one-fourth inch above the top of the plates, but must not be at the level which will prevent gas escapage through the vents. The top of the battery must be kept clean and dry to prevent leakage discharging of the battery.

CAUTION – Assure that the battery acid is correct for the type of cells in the battery. Do not use, for example, an electrolyte designated for lead acid batteries in nickel-iron alkaline batteries.

2.2.6.5.2 Starter Motor. The frequency of starter motor inspection should be dependent on the frequency/severity in operation of the equipment. To inspect the motor, remove the cover band and observe the condition of the commutator and the brushes. If the commutator is rough, pitted, out-of-round, or if the mica is high, the armature should be reconditioned or replaced. Spots of solder on the interior surface of the cover band indicate the starter has been overheated.

Brushes should make good clean contact with the commutator and should have the specified spring tension. Brushes should also have free movement in their holders and if worn severely, they should be replaced.

Symptoms of starter motor malfunctions and their causes are:

1. Starter cranks engine slowly.
   a. Excessive resistance in cranking circuit (check with meters).
   b. Defective cranking motor caused by bent armature or armature dragging on field poles.
   c. Low battery.
2. Starter inoperative.
   a. Open starter circuit (bad cable connections, starter switch, solenoid, or wiring).
   b. Inoperative solenoid.
   c. Defective instrument panel switch.
   d. Defective cranking motor.
3. Starter spins but does not engage.
4. Defective windings.

Performance tests for the starter motor – no load test

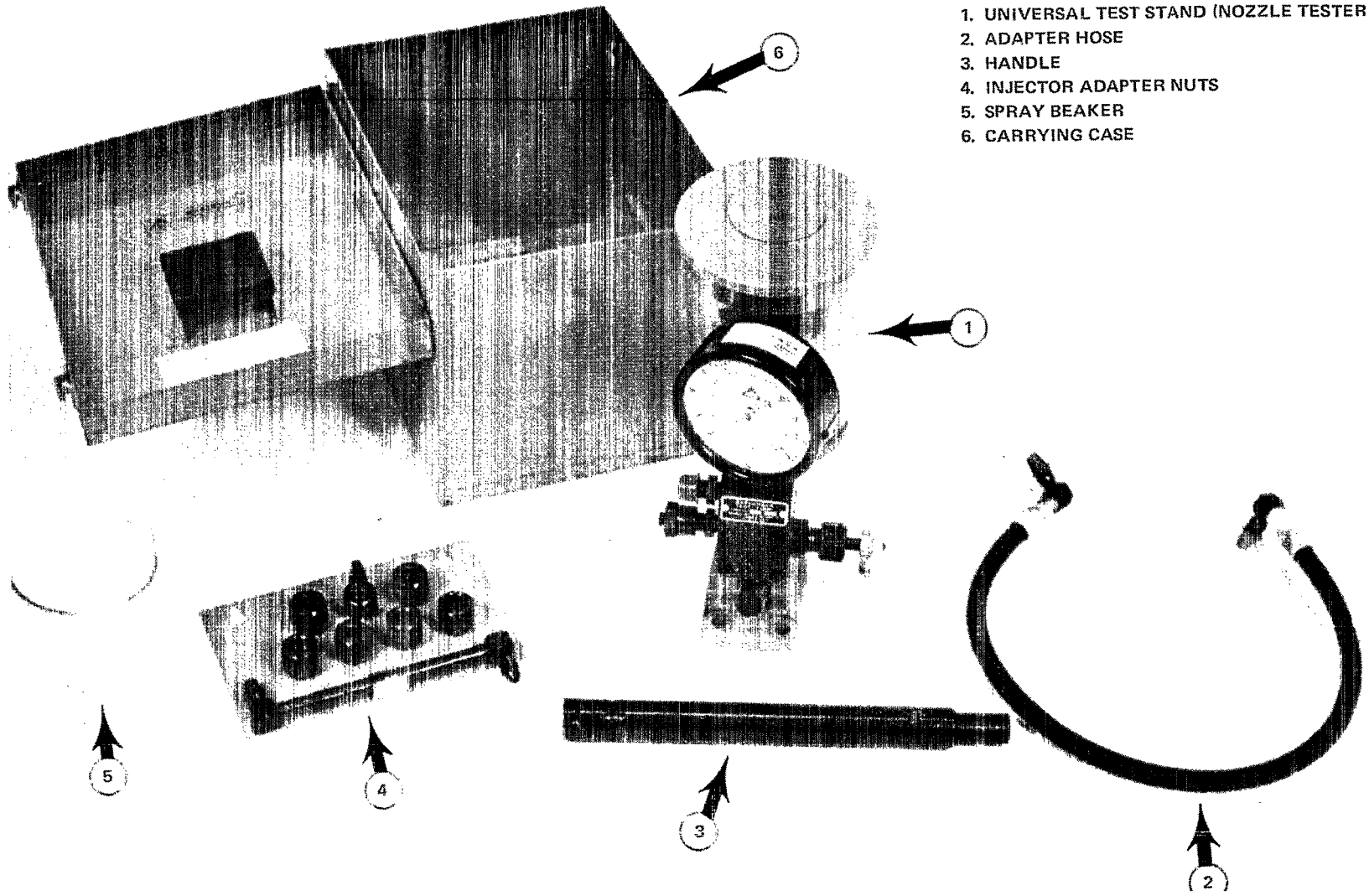
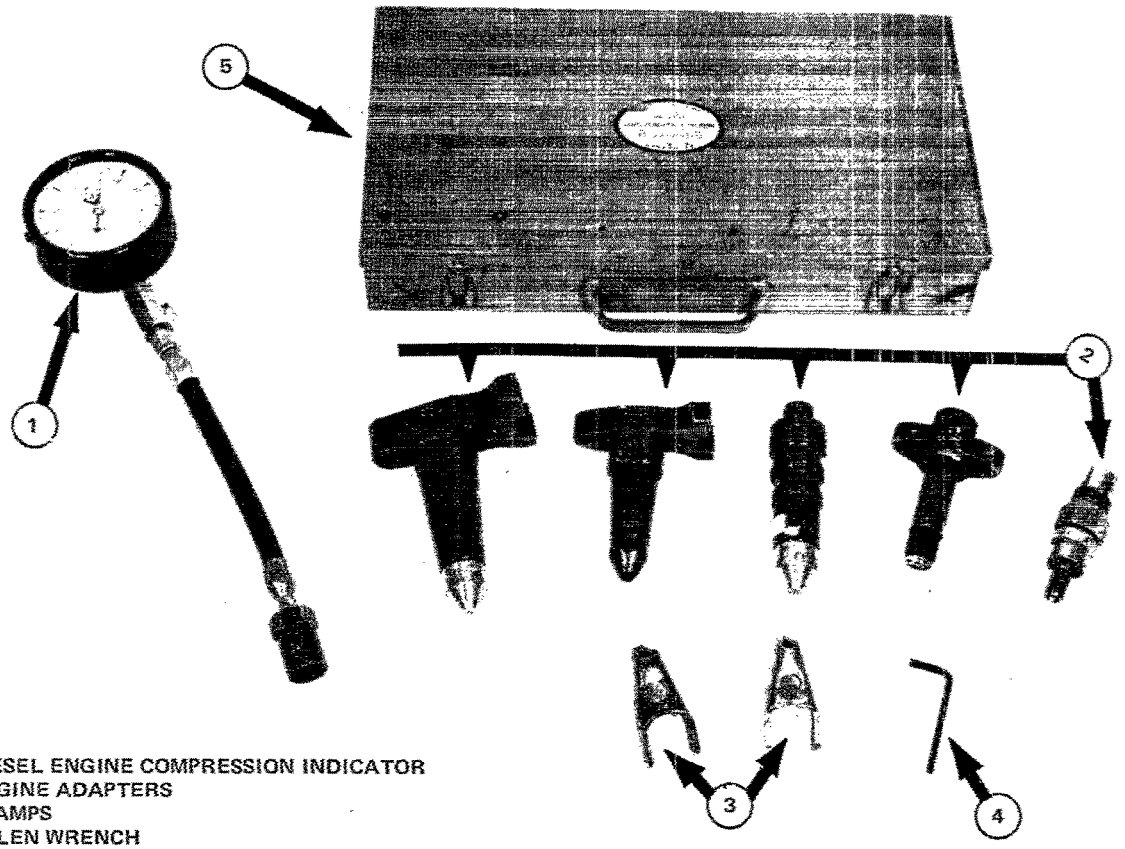


Figure 5. Universal Test Stand and Accessories



1. DIESEL ENGINE COMPRESSION INDICATOR
2. ENGINE ADAPTERS
3. CLAMPS
4. ALLEN WRENCH
5. CARRYING CASE

Figure 6. Diesel Engine Compression Indicator and Accessories

and stall torque test – should be made if applicable, in accordance with the equipment technical manual.

2.2.6.5.3 Distributor. The distributor should be inspected for cleanliness; secure wiring connections; proper operation of the vacuum advance; and no evidence of internal damage to the rotor and the points. All components of the distributor should be clean with no evidence of corrosion at connections. There should be no cracks in the distributor cap or the rotor, and no evidence of burning of the outer ends of the conductor strap of the rotor. Internally, the points must not be excessively worn, pitted, burned, misalined, or out of the adjustment limits specified in the equipment technical manual. Furthermore, although lubrication is necessary for the cam surfaces, the breaker-arm pin, and the wick, there must be no evidence of lubricant on the points.

2.2.6.5.4 Spark Plugs. The spark plugs should be removed and inspected for broken or cracked insulators, excessive carbon deposits, lead fouling, and burned electrodes. Prior to removing the spark plugs, it is advisable to clean the cylinder head seating area to prevent dirt from falling into the cylinder bores.

When installing new spark plugs, make sure they are clean and that the gap is as specified in the equipment technical manual. Cleanliness of the spark plug threads and the cylinder head threads is necessary to preclude poor seating of the plug which may cause compression loss during engine operation.

CAUTION – Always use new gaskets when installing spark plugs, and never overtighten the plugs to the point where gasket distortion and/or cracked insulators will occur.

2.2.6.5.5 Generator. The first step in the generator inspection is to make sure that all electrical connections are tight to provide good electrical contact. Also make certain that the drive pulley is tight on the shaft; and the mounting bolts are tight; and that the drive belt is not excessively worn or evidencing slippage. The belt should be adjusted to the tension specified in the equipment technical manual.

After the initial inspection, if the generator output is not as specified in the equipment technical manual, remove the cover band and inspect the commutator, brushes, and wiring connections. The commutator should not be pitted, rough, or excessively dirty; and the brushes should be in good contact with the armature. If the brushes are severely worn they should be replaced.

CAUTION – Make certain that brush spring tension is in accordance with the equipment technical manual.

The test equipments used for inspection of a generator are:

1. Ammeter
2. Voltmeter
3. Ohm Meter
4. Test Lamp or Buzzer

2.2.6.5.6 Voltage Regulator. The voltage regulator should be inspected to determine whether all connections are clean and secure and that the generator output is properly controlled. This inspection is best accomplished with an ammeter, voltmeter, or variable load resistor (or a combination of the three) as applicable.

2.2.6.5.7 Coil. Inspect the coil to determine whether all wiring connections are clean and secure, and that the case is not cracked. Since the case is hermetically sealed when manufactured, a crack in the case would allow moisture to be absorbed thereby damaging the windings.

2.2.6.5.8 Wiring and Wire Connections. Inspect all high-voltage wiring, including shielding and insulation, to determine if any wires are broken, cracked or chafing against another part; and to assure that all connections are clean, secure, and properly insulated.

NOTE – In the preceding sections discussing the gasoline electrical system, the test set-up utilizing the proper test equipment (ammeters, voltmeters, variable load resistors, test lamps) must be as stated in the applicable equipment technical manual.

2.2.6.6 Power Steering. When loss of steering develops on equipment utilizing power steering, preventive maintenance inspection should be directed to determining if the pump is defective; if there is evidence of lubricant leakage; or if there is insufficient hydraulic oil in the tank. Other components that should be inspected, as applicable to the equipment in use, are noted in paragraph 2.2.5.9.

2.2.7 Maintenance of Electric Powered Equipment

Components of electric powered equipment requiring preventive maintenance servicing and inspection are:

1. Contactor assembly
2. Controller assembly
3. Drive motor
4. Batteries
5. Electric circuitry
6. Dead man brake control
7. Hour meter

These components are common to most electric powered equipment and require a detailed discussion pertinent to preventive maintenance procedures. In addition to these components, the thermal safety switch, although not common to all electric powered equipment, will be discussed within this section. For other components and assemblies which are similar to those on internal combustion engines – tires, steering mechanism, wheel brakes, differential, drive axle, etc. – the discussions presented in paragraph 2.2.6 should be consulted for the applicable preventive maintenance procedures.

2.2.7.1 Contactor Assembly. When there is evidence of malfunction in this assembly during equipment operation, it should be inspected in accordance with the applicable preventive maintenance procedure. The inspection should determine whether there is/are:

1. Burned contact tips; dirt between contacts; insufficient tip pressure; or defective timing relay.
2. Broken control wire or defective microswitch.
3. Worn tips or a loose armature spring.

CAUTION – Never use emery paper to clean contact tips and never file contact tips below tip surface.

2.2.7.2 Controller Assembly. The controller assembly consists of component panels or a terminal board, a manually operated switch and levers, and a foot accelerator. The assembly is electrically connected to the brake in such a way that application of the brake cuts off power to the drive motor. The controller should be inspected for malfunction, as may be indicated by:

1. No response to the controls.
2. Controls do not properly return to neutral position.
3. Sluggish controller action.
4. Failure of individual speed ranges.

To deter these malfunctions, preventive maintenance consists of:

1. Cleaning assembly with clean, dry compressed air to remove accumulations of dirt.
2. Replacing or adjusting defective return springs.
3. Repairing or replacing defective wiring.
4. Replacing contacts when they are worn halfway through.

As part of the inspection, lubricate whatever controller internal points or parts are listed by the equipment manufacturer. Check operating levers for correct over-travel, as well as function. Inspect the directional switch, and replace contacts only when silver has worn thin.

2.2.7.3 Drive Motor. The drive motor should be inspected in accordance with the preventive maintenance schedule applicable to the operational environment; and when equipment operation is abnormal, but the cause of malfunction is not located in the contactor or controller assemblies.

The maintenance procedures consist of:

1. Cleaning exterior surface of motor with clean, dry compressed air and removing grease with a cloth dipped in kerosene. After this cleaning with kerosene, dry exterior surface with compressed air.
2. Cleaning accessible interior of motor with clean, dry compressed air. When there is evidence of grease in accessible parts of the field and armature windings, have motor disassembled for thorough cleaning.
3. Inspecting brushes for:*
   a. Tightness in holders
   b. Loose pig tail in brush
   c. Loose terminal connection
   d. Damaged pig tail insulation
   e. Chipped heel, or toe of wearing surface
   f. Heat cracks
   g. Rough or streaked brush surface
   h. Dirty wearing surfaces
   i. Wornout brushes
   j. Low brush spring pressures
4. Inspecting brush holders for:*
   a. Loose mounting and terminal bolts
   b. Warping or other evidence of overheating
   c. Accumulation of excessive amounts of carbon dust.
   d. Improper positioning
5. Inspecting commutator for:*
   a. Accumulations of carbon dust and grease
   b. Mica projections above, or even with, segment face.

*Repair, replacement, or adjustment of any of these defective components or parts shall be in accordance with the instructions of the applicable equipment technical manual.

c. Pitting and burning of segments
d. Loose or high segments
e. Streaked or threaded bar face
f. Armature coil end connections loose in commutator riser slots
g. Presence of heavy, high resistance oil and oxide film
h. Dirty or loose string band

2.2.7.4 **Electric Circuitry/Minor Components.** The electric circuits should be inspected, with the aid of a multimeter. Capacitors, fuses, resistors, switches, wires, terminals and grounds should be checked for integrity, cleanliness and freedom from damage. Electrical readings should be taken, as indicated by the appropriate technical manual or necessitated by deficiencies in operation.

2.2.7.5 **Thermal Relay Safety Switch.** Inspection of the thermal relay switch requires an operational test to assure that it will initiate disconnection of affected circuits if, through abnormal operation or defective components, the outside surface of the housing reaches a temperature of 228°F. (108.9°C.).

2.2.7.6 **Dead Man Brake Control.** The drive motor brake is a mechanical brake that is automatically applied when, depending on the vehicle in use, the operator's seat is unoccupied or pressure is removed from the foot pedal. Vehicles having this type of dead man brake should receive an operational test to determine that the brake is applied when pressure to the applicable component is removed.

2.2.7.7 **Storage Batteries and Battery Charging Equipment.** Electric powered equipments are powered by industrial storage batteries which require adequate maintenance facilities to obtain maximum life and operating efficiency. Ordinarily, the service life of a bettery is determined by the number of discharge cycles. Therefore, enough batteries with discharge cycles of less than 300 cycles a year per battery should be available. Usually, in a large fleet or electric powered industrial vehicles, there should be one spare battery for every 15 batteries in service.

Normally, a battery is considered as having reached the end of its economical life when it is no longer capable of delivering 80 percent of its rated capacity.

2.2.7.7.1 **Lead-Acid Batteries.** The lead-acid battery (fig. 8) is composed of two different metals immersed in an electrolyte. The active material of the positive plates is lead peroxide and that of the negative plates sponge lead. A lead antimony or lead-calcium grid structure carries the current from the active material to the plate straps and cell terminals. In this battery, diluted sulfuric acid is the electrolyte.

The lead peroxide active material on the positive plate is retained by several methods. In the Multi-Tubular positive plate (see fig. 7) braided fiberglass tubes hold the active material tightly against a central core rod which conducts the current to the terminals. Electrolyte completely surrounds each tube. Microporous separators provide electrical insulation from the negative plates. Because the tubular plate does not increase in length as it ages it is possible to permanently seal the cell top with epoxy or by heat-bonding the cell container and the cover. In flat or pasted plate design (fig. 8) the positive plates are surrounded by multiple layers of high strength glass filaments variously wrapped and bonded to retain the active material in contact with grid. These glass fibers are held in position by a perforated enclosing sheet retainer and it in turn is held in close contact with the microporous separator which provides mechanical and electrical insulation from the negative plates.

2.2.7.7.1.1 **Characteristics.** During discharge, part of the acid in the electrolyte combines with the plates to form lead sulfate resulting in a decrease in the specific gravity of the electrolyte. This loss of specific gravity is directly proportional to the ampere-hour discharge.

The state of discharge may be determined by measuring the specific gravity of the electrolyte with a hydrometer (fig. 9). During recharge, a chemical reaction occurs returning the sulfuric acid from the plates to the electrolyte, thereby increasing the specific gravity of the electrolyte to the fully charged value. When the plates are fully discharged, large current values can be absorbed in recharging with little generation of heat or gas. However, as the charging progresses, the sulphation becomes limited and the charging must be slowed to prevent plate damage due to overheating. Therefore, the tapered charge method is recommended for use when recharging these batteries.

Nominal voltage of these batteries is two volts per cell. Average voltage of each cell during discharge at the 6-hour rate is 1.93 to 1.98 volts per cell. A final voltage of 1.70 per cell is used in establishing the ampere-hour capacity at the 6-hour rate.

Specific gravity of the lead-acid batteries used in electric powered vehicles is 1.270 to 1.290 when the battery is fully charged (temperature corrected to 77°F.) (25°C.). Battery specific gravity is lower by one point (0.001) for every 3°F. the electrolyte is above 77°F. (25°C.).

2.2.7.7.1.2 **Shipment and Storage Requirements.** Batteries used within the continental limits of the United States are furnished in the charged and wet condition. A freshening charge is recommended prior to placing the battery in service.

To activate charged and dry batteries fill cells with electrolyte, allow to stand several hours or overnight, restore electrolyte level, replace vent plugs and place batteries on charge. Continue charging for a minimum of eight hours and as much longer as may be necessary until three successive specific gravity readings taken three hours apart show no further increase. If charging rate is lower than the "Finish rate" on the battery nameplate, extend the time proportionately between readings. If electrolyte temperature rises above 110°F. (44°C.) stop charge temporarily and allow battery to cool.

Upon completion of initial charge the specific gravity of all cells should be within the range 1.270-1.290 as indicated on nameplate. If not within those limits the specific gravity must be adjusted in accordance with the Manufacturer's instructions.

Lead-acid batteries in the wet condition should be placed in storage fully charged and should receive fresh charges periodically during the storage time. The frequency of the recharging will depend upon the temperature of the environment and the age of the battery. The specific gravity should be checked monthly and batteries recharged whenever the specific gravity drops below 1.230.

2.2.7.7.1.3 **Charging.** The lead-acid battery is ideally adapted to an automatic charging method, which is a modification of the constant voltage charging method. This process provides comparatively high starting rates which

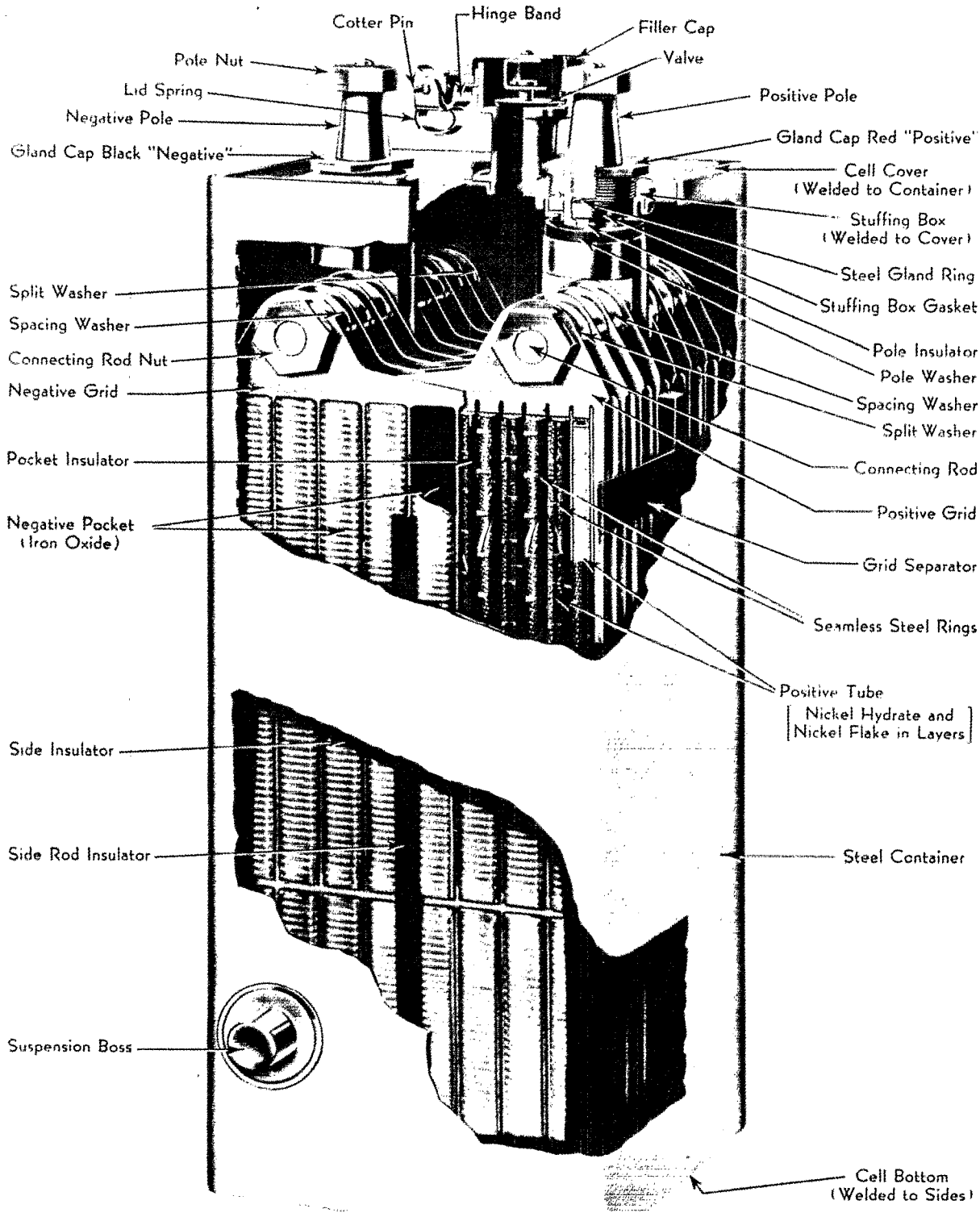


Figure 7. Multi-Tubular Positive Plate

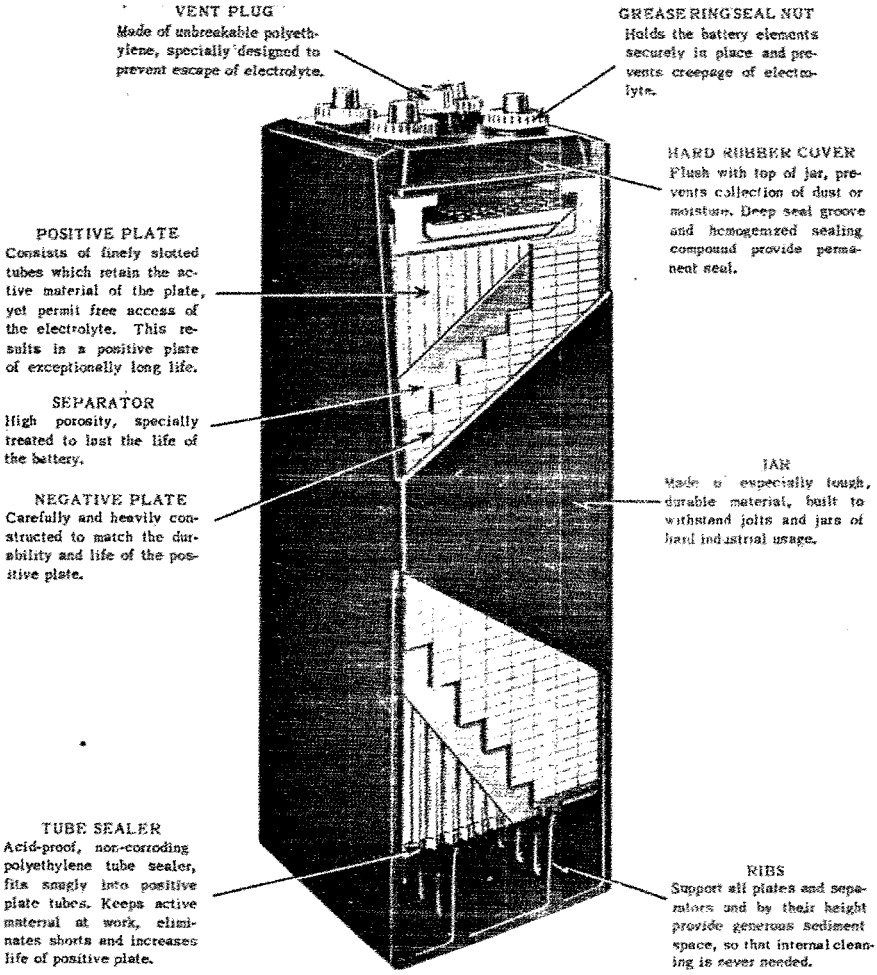


Figure 8. Lead-Acid Battery

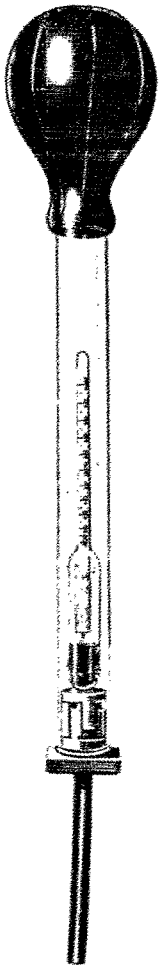


Figure 9. Hydrometer

taper automatically toward the end of the charge to the finishing rate marked on the battery name plate.

Solid state rectifies type chargers have now almost entirely replaced the motor generator type chargers. When older "two-rate" rectifiers are replaced, chargers having taper characteristics should be specified. Convection cooled designs are preferable to fan cooled. Chargers should be capable of complete recharge within 8 hours. The charging rate at the end of charge should not exceed the "finish rate" on the battery nameplate. The charger should control the amount of the recharge to the battery proportionate to the previous discharge. If battery requires water more often than once per week, or if battery electrolyte temperatures exceed 110°F. (44°C.) the battery is being overcharged. If specific is not restored to full charge values the battery is receiving insufficient charge. In either case the charger should be adjusted immediately.

To neutralize acid spills or seepage use bicarbonate of soda solution.

2.2.7.7.1.4 Inspection, Testing, and Maintenance. Lead-acid batteries can be boosted safely at any rate in amperes equal to the number of ampere-hours out of the battery. Boosting rates should never be used on a fully or nearly charged battery.

Periodic equalizing charges are recommended for acid batteries when there is a gradual lowering of specific gravity at the end of a normal charge. Under average operating conditions, w to 5 hours equalizing charge, in addition to the normal charge will suffice. However, equalizing charges should never be given at a rate higher than the finish rate specified by the manufacturer.

Since all batteries lose their charge when standing idle, one freshening charge is recommended for every two months in climates averaging 70° to 80°F. (21° to 27°C.); and every three months if the temperature averages 40°F. (4.4°C.). The freshening charge should be given at the finish rate and continued until the specific gravity returns to its normal maximum, or until it shows no rise for four consecutive hourly readings.

In most places, the water supply is satisfactory for lead-acid batteries. However, before using it, it is recommended that the manufacturer be sent a quart sample, shipped in nonmetallic containers with a nonmetallic stopper, for his approval. Batteries should be watered at regular intervals, using a lead-acid battery automatic cell filler. If a lead-acid battery requires water more than once a week, this may be an indication that the finish rate is too high, the cutoff is not properly adjusted, or the battery is worn out. When watered properly, these batteries are easily cleaned. If the

electrolyte overflows, wipe off the battery with a solution of bicarbonate of soda, using 1 pound to 1 gallon of water; then rinse with clear water and dry.

A specific gravity reading of all cells should be taken at least twice a year, after a thorough equalizing charge. The readings are to be recorded on "Equalizing Charge Gravity Reading (NAVSUP Form 1377/1), figure 10. The gravity reading should be corrected for the temperature of the electrolyte. This correction can be made conveniently with a lead-acid battery thermometer which includes a correction scale along the side of the temperature scale. The gravity readings often indicate early troubles that can be corrected before becoming serious. Low gravity in one cell indicates a leaky jar, faulty cells, or clogged vent. If this low reading is accompanied by a low voltage, internal trouble is indicated. Usually low gravity of all cells indicates the need for an equalizing charge. If both the voltage and specific gravity fail to respond to an overcharge, the battery should be replaced.

Never add acid except after an equalizing charge and never make a specific gravity adjustment by adding acid to a cell which does not gas the charge. If it becomes necessary to add acid, be sure the specific gravity of the acid to be added is only 40 to 50 points higher than in adjacent cells. Do not adjust for differences in specific gravity of less than 20 points in the cells of a battery.

To discharge test a battery, first charge at the finish rate until the specific gravity of the lowest cell stops rising, then for five more hours. At the end of this time, the cell gravities, corrected to 77° F. (25° C.) should be between the limits shown on the battery nameplate, usually 1.270-1.290. Should the voltage of any cell read more than 0.2 volt below the average, repairs or adjustments should be made before proceeding with the test.

The test should be made, starting within 16 hours after completion of the charge, by discharging the battery through a resistance at the 6-hour rate. Cell voltages should be recorded hourly. When the average reading falls to 1.70 the test is to be stopped. Cell voltages will vary, but if any cell falls below 1.70 thirty minutes before the readings, use Test Discharge Recording Chart (NAVSUP Form 1377/2), figure 11. The test should be conducted with electrolyte temperatures as close to 77° F. (25° C.) as possible. The table below gives correction factors to use when electrolyte temperatures vary appreciably from 77° F. (25° C.).

60° F. (16° C.)	0.95
70° F. (21° C.)	.98
90° F. (32° C.)	1.03
100° F. (38° C.)	1.05

To apply the correction factor, select the one closest to the electrolyte temperature at the start of discharge; and divide the time (in minutes) of the discharge test by the factor. The result is the corrected minutes obtained from the battery. Compare this result with the rated 77° F. (25° C.) capacity of 360 minutes (6 hours).

Specific maintenance procedures to be applied to large storage batteries are:

1. Keeping the top section of the batteries clean,

EQUALIZING CHARGE GRAVITY READING
NAVSUP FORM 1377/1 (2-81)

BATTERY NO.	SERIAL		TYPE AND MAKE		DATE NEW	
OVERCHARGE DATES	1.					
1.	2.					
2.	3.					
3.	4.					
4.						
TEST DISCHARGE NO. 1						
DATE						
TEMPL ELECTROLYTE						
AMP. HOURS DELIVERED						
% RATED CAP. DELIVERED						
TEST DISCHARGE NO. 2						
DATE						
TEMPL ELECTROLYTE						
AMP. HOURS DELIVERED						
% RATED CAP. DELIVERED						

X OUT SQUARES NOT REQUIRED FOR LAY-OUT. INDICATE LOCATION OF POSITIVE AND NEGATIVE TERMINALS.

Figure 10.—Equalizing Charge Gravity Reading.

TEST DISCHARGE RECORDING CHART
NAVSUP FORM 1377/2 (2-81)

CAUTION: Be sure battery is FULLY charged before attempting discharge capacity test.

MAKE AND TYPE BATTERY		ELECTROLYTE SOLUTION HEIGHT	DATE ON CHARGE	ACTIVITY	CHARGING STA. NO.
SERIAL NO.				TESTED BY	DATE
DATE OF MFR.	DATE PLACED IN SERVICE	DATE LAST SOLUTION	LENGTH OF CHARGE	AT	

TIME *(Clock)* A.M. P.M.	1	2	3	4	5	6	FINAL
TIME *(Elapsed)*							
TOTAL BATTERY VOLTAGE							
DISCHARGE RATE *(Amperes)*							
AMP. HR. METER READING							
TEMP. TEST CELL NO. ____							
AIR TEMPERATURE							

CELL NO.*	CELL SERIAL *(AD Only)*	BEFORE TEST		VOLTS	SP. GR. OR VOLTS†	VOLTS	SP. GR. OR VOLTS†	VOLTS	SP. GR. OR VOLTS†	VOLTS	SP. GR. OR VOLTS †	VOLTS	SP. GR. OR VOLTS†	VOLTS	SP. GR. OR VOLTS†	VOLTS	SP. GR. OR VOLTS†
		VOLTS	SP. GR.														
1																	
2																	
3																	
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29																	
30																	

*Count cells starting at positive terminal and following path of intercell connectors.

†Use this column for hourly specific gravity readings for lead batteries and for half hourly voltage readings for alkaline cells.

Figure 11.—Test Discharge Recording Chart.

especially with respect to the terminals. These terminals must not be corroded. To prevent this condition, a thin coat of vaseline may be applied to the connections.

2. Maintaining the electrolyte at the proper level.

3. Keeping battery vents open to allow escapage of gas.

4. Sustaining the specific gravity to the level indicated in the equipment technical manual usually 1.270 to 1.290.

5. Detecting overheating during equipment operation.

6. Keeping all connections secure.

7. Assuring that the battery receives the proper amount of charge equivalent to hours of usage.

8. Checking for broken or damaged cells.

2.2.7.7.2 Special Instructions. When placing any battery on charge, assure that there will be good ventilation and dissipation of heat and gases generated by charging. The electrolyte temperature should not be allowed to exceed 115°F. (46°C.). Where surrounding temperatures are high, forced ventilation is recommended to maintain low temperature charging.

Precautions that should be taken to guarantee safe handling and good preventive maintenance for any battery are:

1. Never bring a lighted match or open flame near a battery.

2. Never place a tool or any piece of metal on a battery.

3. Never leave filler caps removed from cells except for hydrometer checks or servicing electrolyte.

4. Never allow exterior of battery to become excessively dirty.

5. Never melt sealing compound too rapidly when preparing to seal the battery.

6. Never work on a battery unless safety goggles and protective clothing are worn.

2.2.7.7.3 Battery Charging Equipment. Proper charging of batteries is a very important daily preventive maintenance operation involved in the utilization of electric powered vehicles. By establishing a good battery maintenance program which is obtained from the proper use of battery charging equipment and the proper maintenance of such equipment, the efficiency of the operation facility will be promoted.

2.2.7.7.3.1 Equipment Types and Related Maintenance. Charging equipment provides completely automatic control of charging with the charging rates, length of charge, and termination accomplished by means of voltage relays and timers built into or used in conjunction with charging equipment. Since only direct current is used, alternating current must be converted to direct current by means of motor generators or rectifiers.

While solid state rectifier type chargers are now used predominately, some motor generator type equipment is still in use and because it is rotating equipment requires careful maintenance procedures.

Rectifier equipment has been greatly improved since its first introduction to MHE battery charging application, and has gained favor because of reduced maintenance, quiet operation and long life expectancy. Alternating current is supplied to the rectifier through a step-down transformer so that voltage will be at the low level required for battery charging. Silicon diode rectifiers and silicon controlled rectifiers (SCR) are now used replacing copper-oxide and selenium rectifier stacks of earlier designs. Initial charging currents are 3 to 4 times the "finish rate" on the battery nameplate, or higher, then taper to the finish rate as the charge progresses. Most units are convection cooled so that little maintenance is required. Maintenance consists primarily of checking to be sure unit is functioning properly and to keep the area clean, clear and well ventilated. Chargers should be elevated or barricaded to prevent damage by the MHE. Damaged charging connectors or charging cables should be replaced immediately. On older units which are fan cooled, air intakes and exhausts should be kept clear, dust and dirt should be periodically vacuumed and fan motor should be checked for proper operation and lubricated as required.

2.2.7.7.3.2 Charge Equipment Controls and Related Maintenance. In the control of charging current, it is necessary to stop the charging current when the battery is fully charged and to prevent over-charging of the battery. Automatic types of battery charging controls are:

1. Voltage relay time
2. Straight timer control

The ampere-hour meter, when panel mounted, is used to terminate the charge through auxiliary contacts which break the circuit when the timing component returns to the zero setting. Proper operation is determined by the timing control which is manually preset prior to the start of the charge. The setting is determined by the state of battery discharge.

Ampere-hour meters are equipped with an adjustable resistor which regulates the percentage overcharge given during each charge. The correct overcharge setting for each battery should be made in accordance with manufacturer's recommendations.

The voltage relay may be of the mechanical type (TVR) or may be a solid state design, unaffected by vibration. The timer does not start until the battery reaches approximately an 80% recharged condition (cell voltage 2.37 per cell), than the timer, usually set for the hours and marked "Daily", continues the charge until 100% recharge is completed. Once each week the timer is set to "weekend" which provides an additional three hours charging at finish rate to restore any lagging cells to full charge condition. Normal daily recharge is accomplished in 8 hours or less depending on the depth of the previous discharge. Changes may shut down in as little as 3¼ hours if the battery has been only lightly discharged.

Straight timer control operates the charger for the full period for which the timer is set, normally 8 hours. The ampere-hours of charge to the battery are the product of the timer setting in hours and the charging rate in amperes. The charging rate holds to a higher value for a battery which has been deeply discharged, but tapers to lower values sooner if the battery has been only lightly discharged.

The voltage relay timer control is used exclusively for lead-acid batteries. It automatically terminates the charge at the proper point without the necessity of first determining the state of discharge since it is designed with inverse temperature compensation which allows it to charge at a low level when the battery temperature is warm and at a high level when the battery is cold.

Maintenance for this timer is limited to periodic inspections to determine that it is properly operating.

2.2.7.7.3.3 Selection of Charging Equipment. When selecting charging equipment, the required information is:

1. Type of battery.
2. Number of cells.
3. Manufacturer's type designation; ampere-hour rating; and recommended starting and finishing rates.
4. Available alternating current, power supply voltage, frequency, and phase.
5. Time available.
6. Type and catalog number of charging connector.

A combination charger-rectifier or single-circuit motor generator capable of charging both lead-acid and nickel-iron-alkaline 36 volt batteries ranging from 280 to 600 ampere-

hours in the nickel-iron-alkaline and 300 to 720 ampere-hours in the lead-acid batteries respectively is advisable. Federal Specifications WC 260 and MIL-M-21491 may be referenced for this equipment to cover specification detail.

2.2.7.7.4 **Hydrometer and Thermometer.** These two instruments are very important for indicating the state of charge existing in a lead-acid battery. When using a hydrometer, enough electrolyte is drawn into the barrel to permit the float to ride freely so that it may be read with the eye level at the electrolyte mark. Correction of the specific gravity reading must be made on the basis of plus or minus 3 points of gravity for each 10°F. (5.5°C.) (electrolyte temperature). Using 77°F. (25°C.) as a base, 3 points of gravity are added to correct for each 10°F. (5.5°C.) above 77°F. (25°C.), and 3 points subtracted for each 10°F. (5.5°C.) below. This correction is necessary to obtain accurate specific gravity readings. As the temperature of the acid rises, the acid expands, becomes less dense, and the float rides low giving readings lower than normal. Conversely, when the acid is cold, the float rides high giving readings higher than normal.

Both instruments must be kept clean and dry while they are not in use and must be carefully handled to preclude unnecessary damage. Occasionally, the hydrometer should be taken apart and the float and inside of the barrel cleaned.

2.2.7.7.5 **Charging Plugs and Receptacles.** The batteries are equipped with a locking half-connector to accommodate the charging half-connector of the charging equipment. Foreign matter such as water, grease, oil, and dirt will render the connector useless unless it is cleaned and repaired. When disassembling, cleaning, repairing, and reassembling these connectors, personnel must observe these precautions:

1. Open battery circuit before removing terminal lugs to prevent injury to personnel and damage to equipment.
2. When reassembling the connector, make sure the negative wire is placed in the negative side and the position terminal to the positive end.

For the mechanical procedures necessary for the above operations, the manufacturer's instructions must be followed.

2.2.7.7.6 **Safety Precautions.** Safety precautions to be observed by operators and maintenance personnel must be in accordance with the United States Navy Safety Precautions (OPNAV 34 P1) and the applicable manufacturer's instructions. For additional precautions, note those mentioned in the foregoing selection (see 2.2.7.7).

2.2.8 Miscellaneous

Equipment such as platform trucks, hand trucks, and carts should be given preventive maintenance consideration even though such maintenance is relatively simple when compared to that required for powered equipment. Illustrated examples of equipment described in this section are contained in Storage and Materials Handling NAVSUP (formerly NavSandA) Publication 284.

2.2.8.1 **Wheels and Casters.** Industrial wheels and casters are made of metal, fabric, plastic, and rubber. These should be replaced when flat spots appear, or when deterioration occurs from exposure to oil, acid, or extreme heat. Generally, sealed bearings are used and require little maintenance. However, all wheels and casters should be lubricated as necessary in accordance with the operational environment and/or the technical manual for that equipment.

2.2.8.2 **Gravity Conveyors.** Generally, roller bearings of gravity conveyors are encased in tubing and locked by a press fit. However, since some of these conveyors are exposed to the weather and high humidity, appropriate measures must be taken to counter rust and corrosion.

2.2.8.3 **Stackers, Manual Low Lift Pallet Trucks, Dollies and Trailers.** All of this equipment requires periodic inspection and lubrication, in order to assure proper and safe operation. Manufacturers provide maintenance and lubrication charts, and repair parts lists, pertinent to the machine supplied. Generally, the wearing parts of these simple equipments are easily removable for quick replacement, when they wear out or fail in service. In small equipment, a primary consideration is to keep all bearings lubricated and free of sand, grit and dust.

CHAPTER 3—COST CONTROL PROCEDURES

SECTION 1—INTRODUCTION

3.1.1 Purpose

The purpose of this chapter is to discuss the procedures designed to facilitate recording and reporting data essential to the materials handling equipment maintenance program.

3.1.2 Scope

The following section outlines the various forms that may be used to control and record preventive maintenance actions. Maintenance actions supplied by manufacturers of MHE or those in the applicable maintenance manuals supplied with the MHE can be used if all required information is present. Any additional data may be recorded as deemed necessary for a particular or unusual local condition.

SECTION 2—MAINTENANCE RECORDS AND REPORTS

3.2.1 Purpose

The purpose of this section is to discuss the maintenance records and reports applicable to maintenance of materials handling equipment.

3.2.2 Scope

The discussion covers the Vehicle PM Record; Dispatch Control Card; Notice of Unsatisfactory Operation; Do Not Operate Tag; and Daily Fuel Consumption Report.

3.2.3 Responsibility

Service scheduling of equipment should be directed from the maintenance shop where all applicable records are kept. For a detailed description of the actual cost control procedures, refer to the NAVCOMPT Manual.

3.2.4 Preventive Maintenance Records

3.2.4.1 **Vehicle PM Record.** The Vehicle PM Record (NAVFAC 11240/6, S/N 0105-LF-003-6530) (figure 12) is maintained for each piece of equipment in order to plan the shop workload. This form is designed as a permanent Key-sort chronological record and can be readily sorted for selection of equipment by PM cycle.

3.2.4.1.1 **Vehicle PM Record Use.** This form is used to schedule the shop workload with respect to PM Groups. At least one week prior to the day of scheduling, select the cards by PM Group Card Code according to the preventive maintenance schedule, which is accomplished by the Key-sort method, thereby eliminating unwanted cards.

The preventive maintenance schedule mentioned above is as follows:

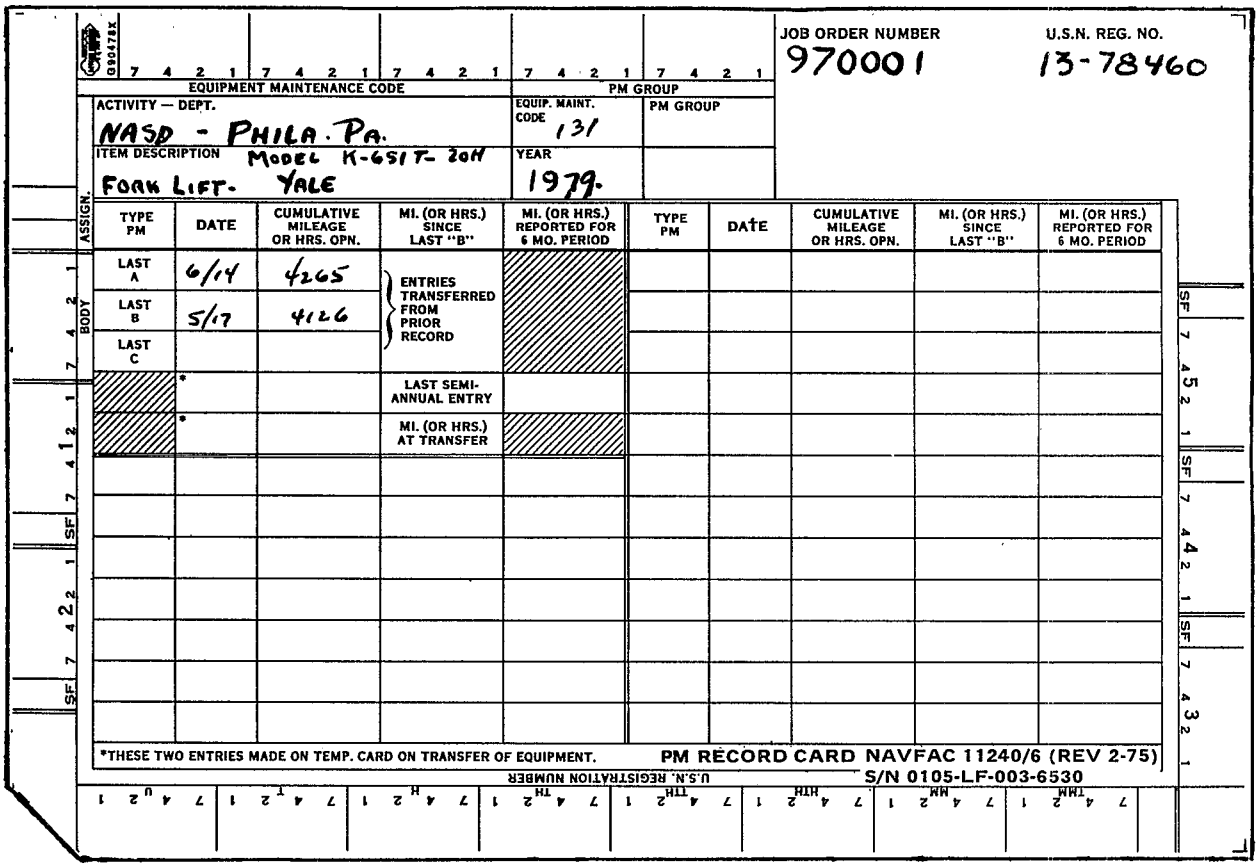
Group	PM cycle	Definition	Schedule
1....	A	Equipment operating under adverse environmental conditions.	40 to 65 days or 100 to 260 hours.
2....	B	Equipment utilized over 100 hours per 65-day period.	65 days or 260 hours.
3....	C	Equipment used less than 100 hours per 65-day period.	130 days.
4....	D	Non-powered.....	90 days.

After each PM Group is selected, notification of the scheduled date for preventive maintenance service is sent to the activity having custody of the equipment. The Shop Repair Order for this service will be made in advance.

This form is then placed in a file and indexed by the PM scheduled dates. Within each PM Group, the individual cards should be in order according to the USN Registration Number. When the equipment enters the shop, this form is removed from the date file and appropriate entries are made.

3.2.4.1.2 **Preparation of the Vehicle PM Record.** Initial preparation of this form involves the recording of necessary data and the punching of applicable code fields as follows:

1. In advance of recording descriptive data on this form, select the number of cards for each PM Group.
2. Batch-groove each group of PM cards in the code section, PM Group Code. Start with PM Group 1 and handle each group separately until all groups have been punched. Place cards in file in order of PM Group Code.



JOB ORDER NUMBER: 970001
U.S.N. REG. NO.: 13-78460
EQUIPMENT MAINTENANCE CODE
PM GROUP
ACTIVITY — DEPT.: NASD - PHILA. PA.
EQUIP. MAINT. CODE: 131
PM GROUP
ITEM DESCRIPTION: FORK LIFT - YALE MODEL K-6SLT-20H
YEAR: 1979.

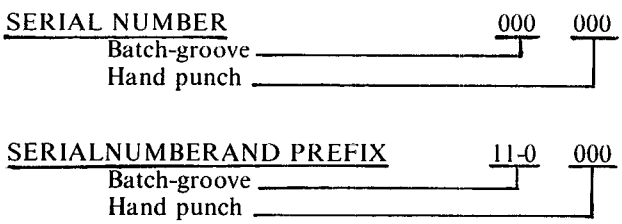
TYPE PM	DATE	CUMULATIVE MILEAGE OR HRS. OPN.	MI. (OR HRS.) SINCE LAST "B"	MI. (OR HRS.) REPORTED FOR 6 MO. PERIOD	TYPE PM	DATE	CUMULATIVE MILEAGE OR HRS. OPN.	MI. (OR HRS.) SINCE LAST "B"	MI. (OR HRS.) REPORTED FOR 6 MO. PERIOD
LAST A	6/14	4265	ENTRIES TRANSFERRED FROM PRIOR RECORD						
LAST B	5/17	4126							
LAST C									
	*		LAST SEMI-ANNUAL ENTRY						
	*		MI. (OR HRS.) AT TRANSFER						

*THESE TWO ENTRIES MADE ON TEMP. CARD ON TRANSFER OF EQUIPMENT.

PM RECORD CARD NAVFAC 11240/6 (REV 2-75)
S/N 0105-LF-003-6530

Figure 12.—Vehicle PM Record.

3. Select the applicable PM Group Card and transcribe from existing records the following information:
   (a) USN Registration Number
   (b) Activity
   (c) Make
   (d) Year Manufactured
   (e) Age of Equipment (insert with pencil)
   (f) Model
   (g) Type of Equipment
4. Enter the job order number and equipment codes.
5. Punch the remaining code fields as follows:
   (a) For equipment type, hand-sort in separate groups by applicable numerical codes. Batch-groove each group.
   (b) For USN Registration Number, punch by using the batch-groove and hand punch. This number consists of a serial number prefix by a 2-digit prefix identifying the type of equipment. By hand-sorting the cards in groups, it is possible to use the batch-groove for large groups of common numbers and to use the hand punch for only the units, ten, and hundreds of the serial numbers as follows:



To avoid mixing the sequence, the prefix is punched in the code fields identified as MM (million) and TMM (ten million).

3.2.4.2 Dispatch Control Card. The appropriate Dispatch Control Card (MHE Gasoline Powered, NAVSUP Form 1377/3 or MHE Electric Powered, NAVSUP Form 1377/4) is used to maintain a history, by component part, of individual repairs performed on each piece of powered materials handling equipment. Examples of these cards are shown in figures 13 and 14. These cards serve as a master reference record for each piece of equipment and, since a history is maintained by component part, they also make areas of repetitive failures readily apparent. Further, these cards contain records pertinent to hours of operation and actual maintenance costs for labor and material; and provide information necessary to determine when equipment should be replaced.

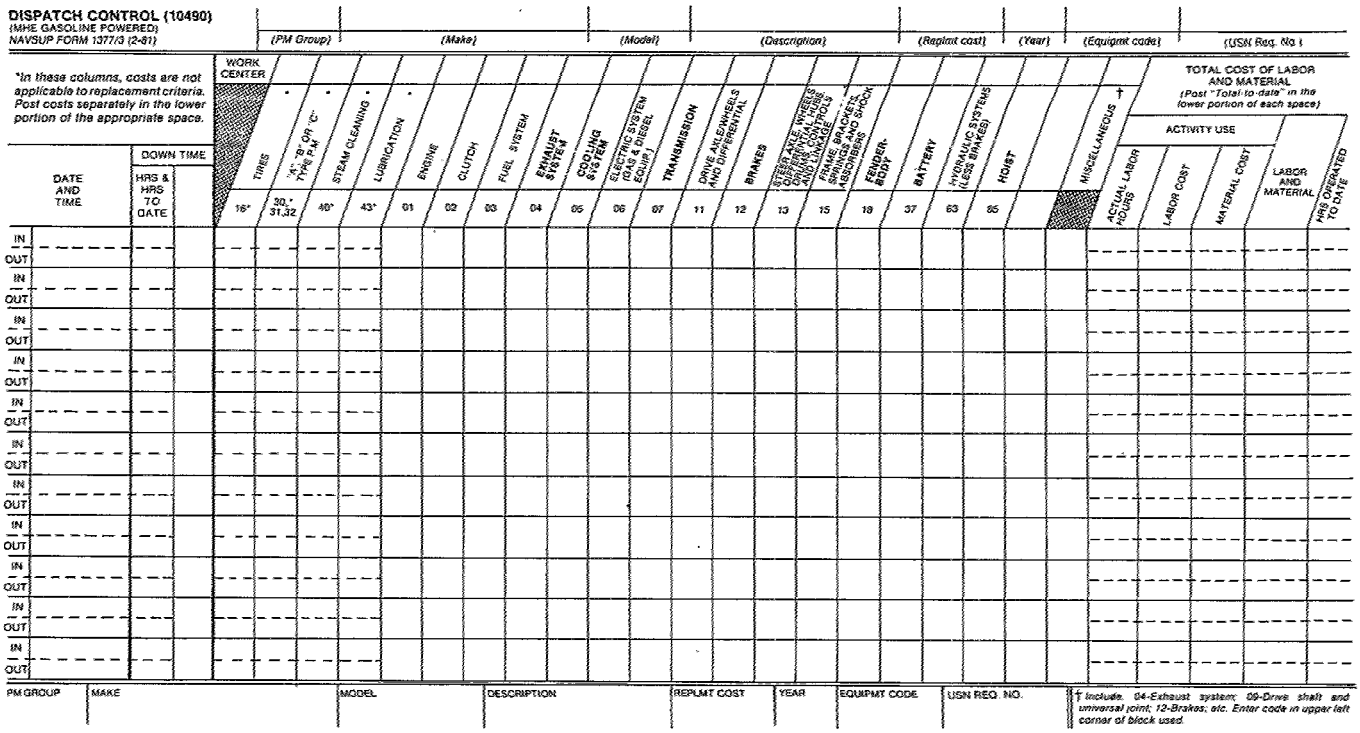


Figure 13.—Dispatch Control Card (Gasoline)

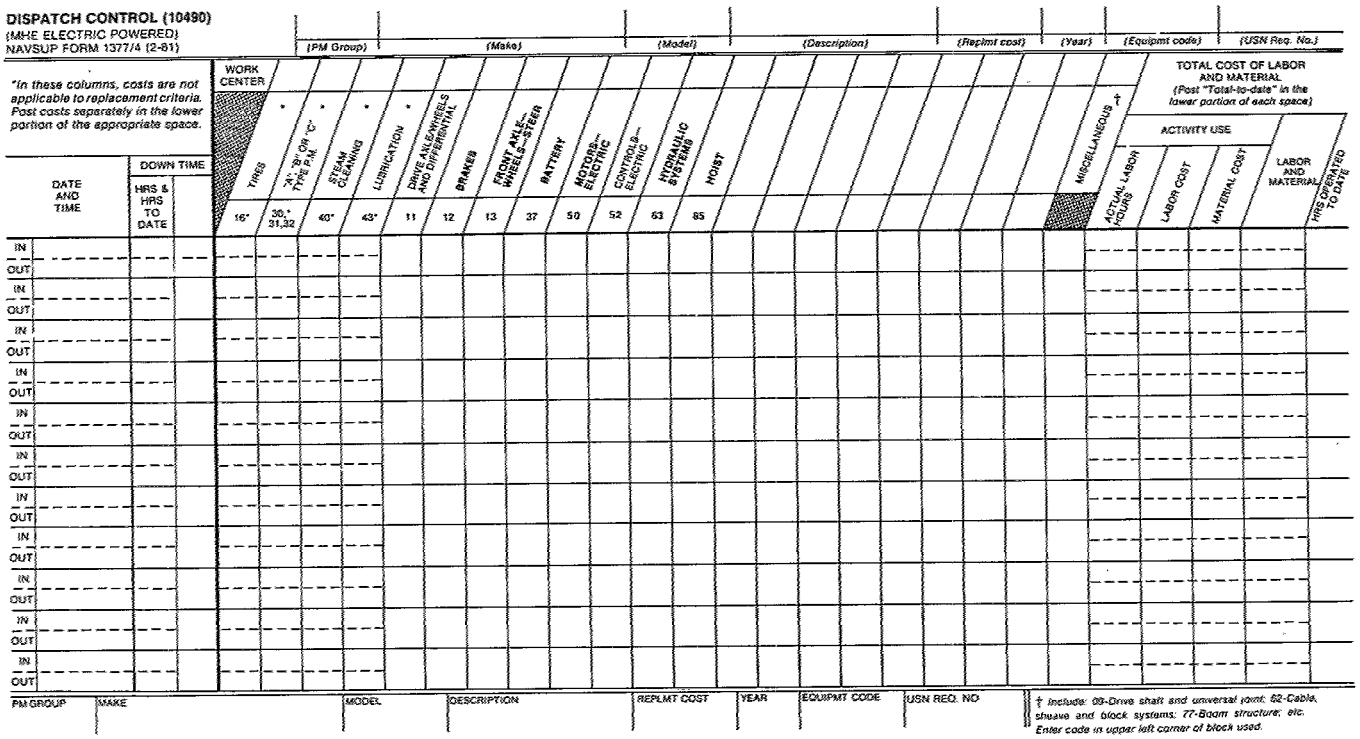


Figure 14.—Dispatch Control Card (Electric)

A card for each piece of equipment will be filed in a visible file in sequence by USN registration number. When equipment history data is continued on a second card, the entries on the last five columns of the first card will be totaled and these totals posted on the new card. The completed card is placed in the Equipment History Jacket (par. 2.1.7, ch. 1). When equipment is transferred, the Dispatch Control Card is made current, filed with the history jacket, and forwarded to the receiving activity.

3.2.4.2.1 Dispatch Control Card Use. Dispatch Control Cards are primarily used for determining repair job progress and recording the maintenance work performed. The recorded information also provides a permanent record for compiling the following data:

1. Labor and material costs
2. Actual operating hours
3. Causes of down time
4. Justification for equipment replacement

It is also used to:

1. Disclose repetitive repairs indicative of negligence; design weaknesses or operational deficiencies; or a need for revision of preventive maintenance scheduling.

2. Indicate the need for revision in time standards due to improvement of repair methods and/or equipment modifications.

3. Enable the Government by early reporting of unsatisfactory equipment conditions, to take advantage of the warranty period.

4. Record delays due to nonavailability of parts thereby providing a means for determining stocking requirements.

3.2.4.2.2 Preparation of Dispatch Control Card. An appropriate card (gasoline or electric) will be prepared for each piece of equipment.

3.2.4.2.2.1 Heading of Card. Fill in blocks in heading of the card as follows:

1. PREVENTIVE MAINTENANCE GROUP. Enter preventive maintenance group code assigned.

2. MAKE. Enter manufacturer of equipment.

3. MODEL. Enter model number.

4. DESCRIPTION. Enter equipment type, i.e., forklift truck, etc.

5. REPLACEMENT COST. Enter current replacement cost. These costs will be provided as enclosures to the current SPCC Instruction 10490.1 and the MHE annual report letter.

6. YEAR. Enter year of manufacture.

7. EQUIPMENT CODE. Enter equipment code number. Refer to NAVCOMPT Manual, Vol III for number.

8. USN NUMBER. Enter U.S. Navy vehicle registration number.

3.2.4.2.2.2 Body of Card. Upon completion of service and/or repairs, the blocks in the body of the card will be filled in from the data obtained on the Shop Repair Order (NAVFAC 11120/3A). Labor charges for lubrication, steam cleaning, and replacement or repair of tires will be posted on a separate line and will not be included in computing total labor costs. Labor charges incurred in preventive maintenance inspection will have only that portion of the charge which applies to direct labor posted to the Dispatch Control Card. Repairs performed as a result of an accident will be entered on a separate line with the letter "A" posted in the down time column. Costs of repairs performed by a commercial shop will be converted to the nearest tenth of an hour, in accordance with actual shop rate, and posted in the appropriate column. The body of the card will be filled in as follows:

1. Date and Time In and Out. Enter date and time of equipment entrance and exit from the repair shop.

2. Down Time. The figure entered for down time will be the difference between actual hours of labor and the total time equipment was under control of the repair shop, with the following exceptions:

(a) Time delay for parts will be recorded by a separate entry in the Down time column under a diagonal line division. The letter "P" denoting delay awaiting parts, will be posted with the repair time in the appropriate repair code column.

(b) Time delay because of labor resons will be recorded in the same manner as parts delay using the letter "L" as the designating symbol.

(c) Repairs performed as a result of breakdown will be entered on a separate line with the letter "B" posted in down time column.

3. Repair Code Columns. Enter actual time required for repair.

4. Actual Hours. Summation of repair times.

5. Labor Cost. Product of actual shop rate multiplied by actual repair time.

6. Material Cost. Cost of materials used for repair.

7. Labor and Material Cost. Summation of five and six above.

8. Hours operated to date. Actual number of equipment operating hours.

3.2.4.3 Daily Fuel Consumption Report. The Daily Fuel Consumption Report (NAVSUP Form 1377/5), figure 15, is designed for recording each fuel issue to a piece of equipment. It is used in compiling data required for reporting procedures.

3.2.4.4 Notice of Unsatisfactory Operation. NAVSUP Form 1280, figure 16, is to be checked daily by every

operator of an electric and gasoline vehicle. The form is designed for reporting equipment deficiencies. The submission of these forms is the primary step in a preventive maintenance program and a very important factor in maintaining equipment in a safe, efficient, and economical condition.

The operator will submit this form to his immediate supervisor who will evaluate the reported defects. Defects determined to be major will be reported to the maintenance supervisor, and a Do Not Operate Tag will be attached to the controls of the equipment. Operational defects determined to be minor will be either deferred until the next scheduled inspection or corrected by a mechanic. This form accompanies the equipment to the repair shop. When the repairs are completed and the Dispatch Control Card filled out, this form is to be destroyed.

DAILY FUEL CONSUMPTION REPORT
NAVSUP FORM 1377/5 (2-81)

ACTIVITY	DATE

	PUMP NO. 1	PUMP NO. 2	PUMP NO. 3	PUMP NO. 4	MOTOR OIL	CHECK
METER CLOSE						
METER OPEN						
GALLONS REGISTERED						

NAVY REGISTRATION NUMBER	JOB ORDER NUMBER	GASOLINE (GAL)	DIESEL (GAL)	LIQUID PETROLEUM (LB)	OIL (QT)	DRIVER
TOTAL						

SERVICEMAN *(Signature)*	DATE

Figure 15.—Daily Fuel Consumption Report

NOTICE OF UNSATISFACTORY OPERATION (10490)
(MATERIALS – HANDLING EQUIPMENT)
NAVSUP FORM 1280 (5-66) PLATE 17959

DATE

REGISTRATION NO. (USN)

TO BE CHECKED DAILY BY OPERATOR

1. Fuel, coolant, and crankcase oil level; also all battery connections and filler caps, *visually*.
2. Tires; availability of tools and safety equipment; external condition.
3. Operation of lights, brakes, windshield wipers, gauges, horn, hour meter, and controls.

NOTE: DISCARD FORM WHEN ACTION IS COMPLETE.

SHIFT HR-METER READINGS	
END	
START	
DIFF.	

Use this form when inspecting equipment before and after operation. Check (✓) in appropriate box(es) to indicate that servicing by maintenance personnel is required.

		START		FINISH	
		O.K.	BAD	O.K.	BAD
1	Tires				
2	Oil				
3	Water				
4	Battery				
5	Engine motor				
6	Arcing of visible contactors *(Check visually)*				
7	Lights				
8	Horn				
9	Hoist				
10	Tilt				
11	Transmission clutch				
12	Controls				
13	Brakes				
14	Steering				
15	Battery-charging unit				
16	Guages, meters				
17	Fire extinguisher				
18					
19					

AREA

OPERATOR'S SIGNATURE

☐ SEE REMARKS ON REVERSE SIDE *(Number remark same as item to which it applies)*

S/N 0108-LF-504-5180

Figure 16. Notice of Unsatisfactory Operation

3.2.4.5 Do Not Operate Tag. A Do Not Operate Tag (NAVSUP Form 1377/6) (fig. 17), attached to the equipment controls denotes the existence of a major defect which adversely affects operation of the equipment. This form will remain attached to the controls until completion of the necessary repair or adjustment and the subsequent inspection indicates that the equipment is ready for use.

NAVSUP FORM 1377/6
S/N 0108-LF-501-3795

NAVY REGISTRATION NO. _____ DATE _____

DO NOT OPERATE

MECHANIC'S NAME _____

Figure 17.—Do Not Operate Tag.

3.2.4.6 Forms Availability (Ordering Data).

NAVSUP Form	Stock Number
1377	0108-LF-501-3770
1377/1	0108-LF-501-3775
1377/2	0108-LF-501-3778
1377/3	0108-LF-501-3780
1377/4	0108-LF-501-3785
1377/5	0108-LF-501-3790

Forms are stocked at all stock points. NAVSUP Form 1377/6, S/N 0108-LF-501-3795, will be available November 1981 at Naval Publications and Forms Center, Philadelphia, PA 19120. DD Form 1362 may be reproduced locally.

CHAPTER 4—REPAIR TIME STANDARDS

SECTION 1—INTRODUCTION

4.1.1 General

This chapter presents the time standards for the repair, overhaul, and maintenance of the materials handling equipment to be used in the cost control program, for the purpose of establishing a measurement and comparison of the time actually consumed on maintenance operations. This information will assist in evaluating the effectiveness of supervision and the productivity of labor forces. As such, the repair time standards are a management tool and are not to be used by management to restrict personnel to specific time limitations in the performance of repair and maintenance functions.

4.1.2 Application Instructions

4.1.2.1 **Presentation.** The equipment codes are presented as separate sections. Identification of equipment codes, equipment and capacities, and of repair codes are provided at the beginning of each section. The two groups are "Basic Standards," when applicable, and "Time Standards." Time is given in tenths of an hour (.1 = six minutes).

4.1.2.2 **Basic Standards.** Basic Standards are classified by letter to designate the various operations. These standards are provided for preparatory jobs prior to unit operations; i.e., blocking up a unit, removing and replacing hood, panels, and floor plates. Basic Standards have been established to eliminate duplication of time allowances when more than one operation is to be performed on a unit. A basic operation should never be credited twice on one unit for the same repair operation.

4.1.2.3 **Repair Time Standards.** Repair Time Standards are provided for actual steps in a job to be performed; i.e., remove and repair clutch, transmission, or steering gear. Repair Time Standards are designated by repair code and operation number.

NOTE – Because of differences in equipment models some standards are estimated and may require adjustment.

4.1.2.4 **Abbreviations.** The following abbreviations are used in these sections:

R & R – Remove and replace the old part, or remove the old part and replace with a new part.

SRT – Solid rubber tire.

PRT – Pneumatic rubber tire.

4.1.2.5 **Examples.** The proper application of time standards is shown by the following examples:

EXAMPLE 1:

Radiator – R & R – Truck, Lift, Fork, Gas – 6,000# Cap. – SRT.

Step 1. Turn to the index of equipment codes, paragraph 4.1.4, and refer to Truck, Lift, Fork, Gas, SRT which is presented in section 8, equipment code 1320.

Step 2. Turn to section 8, and select the repair code. (In this case, 05 Cooling System.)

Step 3. Turn to the Standards for Equipment Code 1320 and refer to the operation, Radiator – R & R, shown as Unit Operation 05–6, with a standard time of 1.3 hour.

EXAMPLE 2:

Radiator – R & R; Water Pump R & R and Overhaul– Truck, Lift, Fork, Gas, 6,000 SRT.

Step 1. Turn to the index of equipment codes, paragraph 4.1.4, and refer to Truck, Lift, Fork, Gas, SRT, which is presented in section 8, equipment code 1320.

Step 2. Turn to section 8, and select the repair code. (In this case, 05 Cooling System.)

Step 3. Turn to the Standards for Equipment Code 1320 and refer to the operation and descriptions. Radiator – R & R is shown as Unit Operation 05–6, Water Pump – Overhaul is shown as Unit Operation 05–10, and Water Pump – R & R is shown as Unit Operation 05–11.

Step 4. Check the descriptions for the operations which follow: Note that in order to remove the water pump it is necessary to remove the radiator. Since Unit operation 05–11 includes the radiator and the basic operations, the total time for the removal and replacement of both the radiator and the water pump is 2.8 hours. In Unit Operation 05–10, the overhaul of the water pump is shown as .6 hour. If the operations are grouped on the shop order, the total time would be 3.4 hours; or, if each operation is to be shown separately, the time may be separated, as follows:

	Hour
Radiator – R & R	1.3
Water Pump – Overhaul	.6
Water Pump – R & R	1.5
Total	3.4

4.1.2.6 **Eliminating Duplication.** Planner estimators should always read the unit operation descriptions thoroughly before applying standards to any group of operations, so that duplication of basic preparatory time is not allowed in the same operation.

4.1.3 Preparing Estimated Standards

4.1.3.1 **General.** Because of the scope of this program, it is impossible to establish a standard for every type of operation that may be performed throughout the maintenance shops. When a standard has not been established, the planner estimator will be required to apply an estimated standard. To facilitate this procedure, and to determine the standards more accurately, it is recommended that these procedures be followed:

1. Classify the unit to be worked on by type, size, and capacity.
2. Determine to which piece of equipment on which

standards have been established the unit is most similar.

3. Study the design of the unit so that a detail of the operation can be outlined.

4.1.3.2 **Submission of Prepared Time Standards.** All repair Time Standards prepared because of engineering design changes of the basic unit, assemblies, attachments or parts thereof, or for new or not covered equipment, by materials handling repair activities will be forwarded to SPCC. New standards will be incorporated into this publication when required.

4.1.4 Index of Equipment and Preventive Maintenance Inspection Standards

Preventive maintenance inspections are conducted as prescribed in chapter 2, section 2, of this publication. The following Time Standards are used to guide the performance of each preventive maintenance inspection for the equipment listed:

Section	Code	Equipment	Time
2	1100	Tractor, Wheeled, Warehouse, Gas, PRT (Up to 4,000# D.B.P.)	0.5
	1110	Tractor, Wheeled, Warehouse, Gas, PRT (Over 4,000# D.B.P.)	.5
3	1120	Tractor, Wheeled, Warehouse, Electric, SRT (2,000# to 4,000# D.B.P.)	.5
4	1200	Crane, Truck, Warehouse, Gas, PRT	.8
	1210	Crane, Truck, Warehouse, Gas, SRT	.8
5	1220	Crane, Truck, Warehouse, Electric, SRT	.8
6	1230	Crane, Truck, Magazine, Electric, Spark Enclosed, SRT	.9
7	1240	Crane, Gas-Electric, SRT (All Capacities)	.8
8	1300	Truck, Lift, Fork, Gas, PRT (Up to 6,000#)	.6
	1310	Truck, Lift, Fork, Gas, PRT (Over 6,000#)	.6
	1320	Truck, Lift, Fork, Gas, SRT (All Capacities)	.6
9	1330	Truck, Lift, Fork, Diesel, PRT (Up to 6,000#)	.6
	1340	Truck, Lift, Fork, Diesel, PRT (Over 6,000#)	.6
	1350	Truck, Lift, Fork, Diesel, SRT (All Capacities)	.6
10	1360	Truck, Lift, Fork, Electric, SRT (All Capacities)	.6
11	1370	Truck, Lift, Fork, Electric Spark Enclosed (All Capacities)	.7
12	1380	Truck, Lift, Fork, Electric Explosion Proof, PRT (All Capacities)	.7
13	1390	Truck, Lift, Fork, Tiering, Straddle and Reach Type, Electric	.8
14	1400	Truck, Fixed Platform, Gas, PRT	.6
15	1410	Truck, Fixed Platform, Electric, PRT	.6
16	1420	Truck, Elevating Platform, Electric, SRT	.6
17	1430	Truck, Elevating Platform, Gas, PRT	.6
18	1500	Truck, Straddle-Carry, Gas or Diesel, PRT (Up to 60,000#)	.8
19	1600	Truck, Hand, Lift, Pallet, Electric (All Capacities)	0.3
	1610	Truck, Hand, Lift, Pallet, Electric, Spark Enclosed (All Capacities)	.3
20	1800	Truck, Lift, Fork, Rough Terrain, Gas, PRT (All Capacities)	.7
21	1810	Truck, Lift, Fork, Rough Terrain, Gas, Crawler (All Capacities)	.7
22	1820	Truck, Lift, Fork, Rough Terrain, Diesel, PRT (All Capacities)	.7
23	1830	Truck, Lift, Fork, Rough Terrain, Diesel, Crawler (All Capacities)	.7
24	1840	Truck, Side Loader, Gas (Up to 10,000#)	.8
	1850	Truck, Side Loader, Gas (Over 10,000#)	.8
25	1860	Truck, Side Loader, Diesel (Up to 10,000#)	.8
	1870	Truck, Side Loader, Diesel (Over 10,000#)	.8
26	1880	Truck, Side Loader, Electric (All Capacities)	.7

Section 2—Equipment Maintenance Codes 1100–1110

TRACTOR, WHEELED, WAREHOUSE, GAS, PRT, ALL MODELS

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal Joint
11—Rear Axle and Differential
12—Brakes
13—Front Axle, Wheels, Controls, and Linkage
15—Frame, Brackets, Springs, and Shock Absorbers
16—Tires

BASIC STANDARDS—EM Codes 1100–1110

		Standard Time
A	Seat Assembly (Allowed in Time Standards)	
B	Hood Assembly—R & R	.2
C	Side Panels (Allowed in Time Standards)	
D	Floor Plates, Front—R & R	.3
	Floor Plates, Rear—R & R	.4
E	Dash Panel and Frame—R & R	.6
F	Block Up Rear or Front End	.2

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01–1	Bearings, Connecting Rod (1)	.3
01–2	Bearings, Main, Adjust or Renew, All	4.5
01–3	Bearings, Main, Oil Seal (Front)	2.0
01–4	Bearings, Main, Oil Seal (Rear)	1.5
01–5	Camshaft (Engine Out)—R & R	1.7
01–6	Camshaft Bushing (1)—R & R	.4
01–7	Carbon and Valve Job	3.4
01–8	Crankshaft (Engine Out)—R & R	3.5
01–9	Cylinder-Rebore (1)	1.5
01–10	Cylinder Head Gasket—R & R	1.5
10–11	Reface Cylinder Head	1.0
01–12	Engine—R & R	5.3
01–13	Engine Cylinder Block Overhaul (Engine In) and Tune Up	16.0
01–14	Engine Dynamometer Test	2.2
01–15	Engine Overhaul, Complete Recondition and Tune Up	32.0
01–16	Engine Support Mountings (Front)—R & R	1.0
01–17	Engine Support Mountings (Rear)—R & R	.6
01–18	Engine Tune Up—Minor	.5
01–19	Engine Tune Up—Major	1.5
01–20	Flywheel—R & R	3.0
01–21	Flywheel Reface	1.0
01–22	Flywheel Ring Gear (Flywheel Out)—R & R	.4
01–23	Engine-Ring Job and Tune Up	8.6
01–24	Oil Filter Cartridge—R & R	.3
01–25	Oil Pan and/or Gasket—R & R	1.1
01–26	Oil Pressure Gage—R & R	.3
01–27	Oil Pump—R & R	.4
01–28	Oil Pump Recondition—Removed	.4
01–29	Pins, Fit (1)	.2
01–30	Piston Assembly, Renew, Including Tune Up	4.2
01–31	Piston Assembly, Renew, Each Additional	.9
01–32	Piston Renew (1)	.5
01–33	Retime Valves	2.6
01–34	Timing Case Cover and/or Gasket—R & R	2.2
01–35	Timing Chain and Sprocket—R & R	2.4
01–36	Valve (1-Each Additional .3)—R & R	.7
01–37	Valve Guide (1)—R & R	.2
01–38	Valve Insert (1)—R & R	.3

Engine—Repair Code 01—Continued

Operation	Description	Time
01–39	Valve Side Cover Gasket—R & R	.3
01–40	Valve Spring (1)—R & R	.2
01–41	Valve Tappets, Adjust	1.4

Clutch—Repair Code 02

Operation	Description	Time
02–1	Clutch Assembly—R & R	2.7
02–2	Clutch Driven Plate—Recondition—Removed	.7
02–3	Clutch Cover Assembly—Recondition—Removed	1.3
02–4	Clutch Housing (Includes Engine R & R)—R & R	6.8
02–5	Clutch Pedal Adjust	.5
02–6	Clutch Pedal Rebush—R & R	1.5
02–7	Clutch Pedal Return Spring—R & R	1.1
02–8	Clutch Release Bearing—R & R	1.7
02–9	Clutch Release Fork—R & R	1.7

Fuel System—Repair Code 03

Operation	Description	Time
03–1	Accelerator Spring—R & R	1.1
03–2	Carburetor—Adjust	.2
03–3	Air Filter—Clean	.2
03–4	Carburetor—Adjust with Gages—R & R	1.2
03–5	Carburetor Air Cleaner Service—R & R	.2
03–6	Carburetor Linkage Recondition	.5
03–7	Carburetor and/or Gasket—R & R	.4
03–8	Carburetor Overhaul—R & R	1.4
03–9	Carburetor Overhaul—Removed	1.0
03–10	Flexible Fuel Line—R & R	.5
03–11	Fuel Bowl Gasket—R & R	.3
03–12	Fuel Filter—R & R	.2
03–13	Fuel Gage—R & R	.3
03–14	Fuel Line (Pump to Carburetor)—R & R	.3
03–15	Fuel Line Manufacture	.5
03–16	Fuel Line (Tank to Pump)—R & R	1.0
03–17	Fuel Pump and/or Gasket—R & R	.5
03–18	Fuel Pump Overhaul (Pump Off)	.6
03–19	Fuel Tank—R & R	1.0
03–20	Governor—Adjust	.2

TIME STANDARDS—Continued

Exhaust System—Repair Code 04

Operation	Description	Time
04-1	Exhaust Pipe—R & R	.9
04-2	Gasket, Exhaust Pipe—R & R	.4
04-3	Gasket, Manifold—R & R	1.2
04-4	Manifold, Exhaust or Intake—R & R	2.1
04-5	Manifold Heat Control Valve—R & R	.5
04-6	Muffler—R & R	1.2
04-7	Tail Pipe—R & R	.7

Cooling System—Repair Code 05

Operation	Description	Time
05-1	Fan Belt—R & R	.3
05-2	Fan Blade—R & R	.5
05-3	Head Water Outlet Gasket—R & R	.4
05-4	Radiator—R & R	1.3
05-5	Radiator Drain Cock—R & R	.3
05-6	Radiator Hose, Lower—R & R	.3
05-7	Radiator Hose, Upper—R & R	.2
05-8	Temperature Gage—R & R	.4
05-9	Thermostat—R & R	.5
05-10	Water Pump—R & R	1.3
05-11	Water Pump Recondition (Pump Removed)	.8
05-12	Cooling System—Flush	1.0

Electric System—Repair Code 06

Operation	Description	Time
06-1	Ammeter—R & R	.4
06-2	Battery—R & R	.3
06-3	Battery Cable (Each)—R & R	.3
06-4	Battery Holddown—R & R	.2
06-5	Condenser—R & R	.2
06-6	Distributor—R & R	.5
06-7	Distributor Cap—R & R	.3
06-8	Distributor Recondition (Distributor Removed)	.8
06-9	Generator—R & R	.5
06-10	Generator Recondition (Generator Removed)	1.0
06-11	Generator Armature—R & R	.8
06-12	Generator Bushes—R & R	.4
06-13	Generator Circuits Tested	.5
06-14	Headlight—R & R	.2
06-15	Headlight Assembly—R & R	.5
06-16	Horn—R & R	.3
06-17	Horn Button—R & R	.3
06-18	Ignition Coil—R & R	.3
06-19	Ignition Points—R & R	.4
06-20	Reset Ignition Timing	.2
06-21	Spark Plugs, One Set, Clean and Reset—R & R	.4
06-22	Spark Plug Wires, One Set—R & R	.4
06-23	Starter—R & R	.9
06-24	Starter Solenoid—R & R	.7
06-25	Starter Armature—R & R	.8
06-26	Starter Brushes—R & R	.4
06-27	Starter Recondition (Removed), Renew Field Cores	.6
06-28	Starter Switch—R & R	.4
06-29	Switch—R & R	.4
06-30	Tail or Stoplight—R & R	.2
06-31	Tail or Stoplight Assembly—R & R	.5
06-32	Voltage Regulator—R & R	.3
06-33	Voltage Regulator Check and Adjust	.4
06-34	Voltage Regulator Recondition—Removed	1.0
06-35	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time
07-1	Automatic Transmission—R & R	3.5
07-2	Automatic Transmission Governor Assembly Condition—R & R	1.8
07-3	Automatic Transmission Housing Oil Seal	1.0
07-4	Automatic Transmission Oil Pump, Add Automatic Transmission—R & R for Front Pump	1.8
07-5	Automatic Transmission Regulator Valve Body—R & R	3.4
07-6	Fluid Coupling—R & R	3.5
07-7	Fluid Coupling Seal (Assembly Removed)	1.3
07-8	Shift Mechanism, Recondition	.8
07-9	Shift Mechanism, Recondition—R & R	.6
07-10	Torque Converter—R & R	4.5
07-11	Torque Converter Adapter or Adapter to Housing Seals—R & R	4.5
07-12	Torque Converter Adapter to Engine Seals—R & R	4.5
07-13	Transmission—R & R	1.8
07-14	Transmission Rear Seal—R & R	1.9
07-15	Transmission, Recondition (Transmission Removed)	2.8
07-16	Transmission Cover and Shift Assembly—Recondition	1.7

Drive Shaft and Universal Joint—Repair Code 09

Operation	Description	Time
09-1	Universal Joint (1)—R & R	.6
09-2	Universal Joint (1)—Recondition	.6

Drive Axle, Wheels, and Differential—Repair Code 11

Operation	Description	Time
11-1	Differential Assembly—R & R	2.5
11-2	Differential Pinion Oil Seal—R & R	2.0
11-3	Differential Assembly Adjust Ring Gear and Pinion	1.6
11-4	Differential Assembly Recondition (Differential Removed)	3.8
11-5	Drive Axle (2)—R & R	1.3
11-6	Drive Axle Bearings and Oil Seal (Each Axle)—R & R	1.0
11-7	Drive Axle Bearings and Cones (Each Axle)—R & R	.7
11-8	Drive Wheel—R & R	.4

TIME STANDARDS—Continued

Brakes—Repair Code 12

Operation	Description	Time
12–1	Brake Adjustment (Major), After Relining	.9
12–2	Brake Adjustment (Minor), Includes Bleeding	.6
12–3	Brake Drum Turning (One Removed)	.8
12–4	Brake Hub and Drum (1)—R & R	.4
12–5	Brake Line (1) Includes Fill Master Cylinder and Bleeding—R & R	.5
12–6	Brake Pedal Free Play Adjustment	.3
12–7	Brake Pedal Rebush—R & R	1.5
12–8	Brake Pedal Return Spring—R & R	.2
12–9	Brake Relining (2 Wheels)—R & R	1.7
12–10	Brake Shoes Reline (Per Wheel)	.6
12–11	Bleed Brake System, Includes Fill Master Cylinder	.6
12–12	Handbrake—R & R	.7
12–13	Handbrake—Adjustment	.3
12–14	Handbrake Drum	.7
12–15	Handbrake Drum—R & R	1.5
12–16	Handbrake Reline	.7
12–17	Master Cylinder—R & R	.6
12–18	Master Cylinder Hone and Rebuild (Cylinder Off)	.6
12–19	Wheel Cylinder (1) (Wheel Off)—R & R	.5
12–20	Wheel Cylinder Rebuild (Wheel Off)	.3

Front Axle—Wheels—Controls and Linkage—Repair Code 13

Operation	Description	Time
13–1	Drag Link (1), Clean and Lubricate—R & R	.6
13–2	Horn Wire in Steering Column—R & R	.4
13–3	Pitman Arm Assembly—R & R	.4
13–4	Power Steering Booster—R & R	2.0
13–5	Power Steering Booster Adjustment	1.0
13–6	Power Steering Booster Recondition (Removed)	2.1
13–7	Steering Arm—R & R	.7
13–8	Steering Assembly Alinement	.7
13–9	Steering Gear Assembly—R & R	1.5

Front Axle—Wheels—Controls and Linkage—Repair Code 13—Continued

Operation	Description	Time
13–10	Steering Gear Assembly Adjust	.7
13–11	Steering Gear Assembly Cross Shaft and Seal—R & R	.8
13–12	Steering Gear Assembly Recondition (Off)	1.6
13–13	Steering Knuckle (1)—R & R	.8
13–14	Steering Knuckle Ball Joints Adjust (1)—R & R	.3
13–15	Steering Knuckle Pins and Bushings (1 Wheel)—R & R	1.1
13–16	Steering Wheel—R & R	.3
13–17	Steering Wheel Hand—R & R	.3
13–18	Steering Wheel Bearings, Clean and Lubricate—R & R	.4
13–19	Tie Rod End (1), Clean and Lubricate—R & R	.5
13–20	Tie Rod End (1), Rod Off—R & R	.3
13–21	Tighten Steering Gear Mounting Bolts	.3
13–22	Tighten Suspension and Steering Linkage	1.0
13–23	Steering Axle—R & R	1.6
13–24	Steering Axle Recondition	2.5

Frame, Brackets, Springs, and Shock Absorbers—Repair Code 15

Operation	Description	Time
15–1	Coupler Assembly Latch—R & R	.2
15–2	Coupler Assembly Latch Spring—R & R	.2
15–3	Springs (1)—R & R	1.1
15–4	Spring Center Bolt—R & R	1.2
15–5	Spring Shackle Assembly (1)—R & R	.4

Tires—Repair Code 16

Operation	Description	Time
16–1	Tire, Drive Wheel, Pneumatic (1), Includes Wheel Removal and Repair—R & R	.5
16–2	Tire, Steer Wheel, Pneumatic (1), Includes Wheel Removal and Repair—R & R	.4

Section 3—Equipment Maintenance Code 1120

TRACTOR, WHEELED, WAREHOUSE, ELECTRIC, SRT, 2,000# TO 4,000# D.B.P.

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
13—Front Axle, Wheels, Controls, and Linkage
16—Tire—Solid
18—Body, Fenders, Guards
37—Battery
50—Electric Motors
52—Electric Controls

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time Model Up to 4000#
11-1	Differential—overhaul (out-of-unit)	2.1
11-2	Differential—R & R	1.5
11-3	Drive Axle—R & R	.2
11-4	Drive Wheels—R & R	.5
11-5	Drive Wheel Bearings—remove, repack and replace	.8
11-6	Drive Wheel Sprocket—R & R	1.5
11-7	Jackshaft—R & R	1.5
11-8	Jackshaft Bearings—R & R	1.5

Brakes—Repair Code 12

Operation	Description	Time Model Up to 4000#
12-1	Brakes—Adjustment—Major	1.0
12-2	Brakes—Adjustment—Minor	.5
12-3	Brake Band—reline	.2
12-4	Brake Pedal Return Spring—R & R	.2
12-5	Seat Brake—adjust	.2
12-6	Brake Shoes—R & R	1.5
12-7	Brake Shoes—reline (out-of-unit)	.4

Front Axle—Wheels—Controls Linkage—Repair Code 13

Operation	Description	Time Model Up to 4000#
13-1	Drag Link—R & R	.4
13-2	Front Suspension Spring—R & R—One Spring	.6
	Front Suspension Spring—R & R—Two Springs	1.2
13-3	Rear Suspension Spring—R & R—One Spring	.6
	Rear Suspension Spring—R & R—Two Springs	1.2
13-4	Steer Axle Assembly—Overhaul (out-of-unit)	1.5
13-5	Steer Axle Assembly—R & R	.7
13-6	Steer Gear—Overhaul (out-of-unit)	.8
13-7	Steer Gear—R & R	1.1
13-8	Steer Wheels—R & R	.2
13-9	Steering—Inspect and Service	.3
13-10	Wheels—R & R	.4
13-11	Wheel Bearings—remove, repack, and replace	.6
13-12	Steering Turntable—Adjust	3.0
13-13	Steering Handle—R & R	.8
13-14	Steering Handle Return Spring—R & R	.2
13-15	Turntable Adjustment Ring—R & R	2.5

Tire—Solid—Repair Code 16

Operation	Description	Time Model Up to 4000#
16-1	Tires—Front—R & R (Solid)	1.0
16-2	Tires—Rear—R & R (Solid)	1.0

Body—Fenders—Guards—Repair Code 18

Operation	Description	Time Model Up to 4000#
18-1	Hitch—R & R	.2
18-2	Hitch Tongue—R & R	.1
18-3	Seat Spring—R & R	.4
18-4	Rear Wheel—R & R	.5

Battery—Repair Code 37

Operation	Description	Time Model Up to 4000#
37-1	Battery—R & R (Check all Grounds)	.3
37-2	Battery Plug—R & R	.5
37-3	Charging Plug—R & R	.5

Electric Motors—Repair Code 50

Operation	Description	Time Model Up to 4000#
50-1	Drive Motor—Clean and Inspect	.5
50-2	Drive Motor—R & R	1.0
50-3	Drive Motor—Overhaul	6.0
50-4	Drive Motor Wires—R & R	.3

Electric Controls—Repair Code 52

Operation	Description	Time Model Up to 4000#
52-1	Contacts—One Set—R & R	.2
	Add for each additional set replaced	(.1)
52-2	Contacts (All)—Clean & Service	.9
52-3	Control Pedal Return Spring—R & R	.1
52-4	Drive Controller—Repair	Est.
	Estimate time for repair or use actual time	Est.
52-5	Drive Motor Controller—Clean and Inspect	.5
52-6	Limit Switch—Adjust	.2
52-7	Limit Switch—R & R	.4
52-8	Horn—R & R	.3
52-9	Horn Button—R & R	.3
52-10	Horn Adjustment	.1
52-11	Hour-Meter—R & R	.3
52-12	Battery Flush	.3
52-13	Battery Cable Lug Resolder	.5
52-14	Drive Motor, Overhaul	32.0
52-15	Drive Resistor—R & R	1.0
52-16	Contacts, One Set (Clean)	.1

Section 4—Equipment Maintenance Codes 1200-1210

CRANE TRUCK, WAREHOUSE, GAS

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal Joint
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls and Linkage
16—Tires
18—Hood—Fenders and Body
37—Battery
62—Cable System
85—Hoist and Winch Assemblies

BASIC STANDARDS—EM Codes 1200–1210

		Standard Time
A	Seat and Hood Cover—R & R	.4
B	Side Plates, R or L—R & R	.1
C	Block up Crane—Regular	.1
C-1	Block up Crane for Rear End	.3
D	Support Boom Structure	.3

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01-1	Engine—Bore for Sleeves	13.2
01-2	Engine—Bore Oversize	7.2
01-3	Engine—Disassemble	2.5
01-4	Engine—Dynamometer Test	2.2
01-5	Engine—Head and/or Gasket—R & R	1.3
01-6	Engine—R & R	4.2
01-7	Engine—Reassemble	8.6
01-8	Engine—Tappets—Adjust	2.6
01-9	Engine—Tune-up	1.2
01-10	Engine—Valve Springs—R & R	2.3
01-11	Oil Gauge—R & R	.3

Clutch—Repair Code 02

Operation	Description	Time
02-1	Clutch—Adjust	.4
02-2	Clutch—Facing—Reline	.3
02-3	Clutch—Pressure Plate—Facing and/or Release Bearing—R & R	1.9
02-4	Clutch—Pressure Plate—Overhaul	.7
02-5	Flywheel—R & R	2.0
02-6	Ring Gear on Flywheel—R & R	.2

Fuel System—Repair Code 03

Operation	Description	Time
03-1	Air Filter—Clean—R & R	.3
03-2	Carburetor—Governor—Adjust	.3
03-3	Carburetor—Overhaul	.6
03-4	Carburetor—R & R	.5
03-5	Fuel Gauge—R & R	.2
03-6	Fuel Pump—Overhaul	.6
03-7	Fuel Pump—R & R	.5
03-8	Gas Filter—Clean—R & R	.3
03-9	Gas Tank—R & R	.5

Exhaust System—Repair Code 04

Operation	Description	Time
04-1	Exhaust Pipe and/or Gasket—R & R	.6
04-2	Heat Control Thermostat—R & R	1.0
04-3	Intake and Exhaust Section Gasket—R & R	1.3
04-4	Manifold and/or Gasket—R & R	1.2
04-5	Muffler—R & R	.4

Cooling System—Repair Code 05

Operation	Description	Time
05-1	Fan—Pump to Generator Belt—R & R	.4
05-2	Fan Belt—Adjust	.5
05-3	Fan Belt—R & R	.6
05-4	Fan Blade—R & R	.7
05-5	Fan Blade Bearings—R & R	2.0
05-6	Head Water Outlet Gasket—R & R	.6
05-7	Radiator—R & R	1.3
05-8	Radiator Hose—Lower—R & R	.5
05-9	Radiator Hose—Upper—R & R	.5
01-10	Radiator Hoses—Upper and Lower—R & R	.7
05-11	Radiator or Engine Drain Cock—R & R	.1
05-12	Temperature Gauge—R & R	.3
05-13	Water Pump—Overhaul	.7
05-14	Water Pump—R & R	.8
05-15	Cooling System—Flush	1.0

Electric System—Repair Code 06

Operation	Description	Time
06-1	Ammeter—R & R	.3
06-2	Coil—R & R	.4
06-3	Dash Panel—Rewire	1.4
06-4	Distributor—Overhaul	.6
06-5	Distributor—R & R	.4
06-6	Generator—Adjust	.4
06-7	Generator—R & R	.5
06-8	Horn—R & R	.2
06-9	Horn Button—R & R	.2
06-10	Horn Wire to Button—R & R	.2
06-11	Ignition Switch—R & R	.3
06-12	Lights (Head, Rear, or Stop) R & R	.2
06-13	Light Switch—R & R	.3
06-14	Spark Plugs—R & R	.3
06-15	Spark Plug Wires—R & R	.5
06-16	Starter Cable—R & R	.4
06-17	Starter Motor—R & R	.6
06-18	Starter Switch—R & R	.3
06-19	Starter Switch Cable to Battery—R & R	.2
06-20	Voltage Regulator—Adjust—Service	.3
06-21	Voltage Regulator—R & R	.4
06-22	Hour Meter—R & R	.3

TIME STANDARDS—Continued

Transmission—Repair Code 07

Operation	Description	Time
07-1	Transmission—Overhaul	3.5
07-2	Transmission—R & R	1.7
07-3	Transmission—Service and Inspect (out-of-unit)	1.6

Automatic Transmission

Operation	Description	Time
07-4	Automatic Transmission—R & R	3.7
07-5	Automatic Transmission Oil Pump R & R add Automatic Transmission R & R for Front pump	1.8
07-6	Automatic Transmission Housing Oil Seal—R & R	1.0
07-7	Automatic Transmission Regulator Valve Body—R & R	3.4
07-8	Automatic Transmission Governor Assembly—Recondition	1.8

Drive Shaft and Universal Joint—Repair Code 09

Operation	Description	Time
09-1	Universal Joint—Propeller Shaft—Overhaul	.2
09-2	Universal Joint—Propeller Shaft—R & R	.5

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11-1	Differential—Overhaul	2.9
11-2	Differential—Ring and Pinion Gear (out of unit) R & R	1.0
11-3	Differential Assembly—R & R	2.2
11-4	Drive Axle—Inspect—Service—Overhaul (out of unit) (Both Axles)	1.6
11-5	Drive Axle—R & R (Both Sides)	3.6
11-6	Drive Wheels—Bearings and Grease Seals (Both Wheels)	.8
11-7	Drive Wheels—R & R (Both Wheels)	2.7
11-8	Internal Final Drive Gear—R & R (Per Wheel)	2.4

Brakes—Repair Code 12

Operation	Description	Time
12-1	Brakes—Major Adjustment	1.0
12-2	Brakes—Minor Adjustment	.5
12-3	Brake Cylinder—Overhaul (Per Cylinder)	.4
12-4	Brake Cylinder—R & R	1.0
12-5	Brake Drum—R & R	1.8
12-6	Brake Line—Center—R & R	.3
12-7	Brake Line (R or L) R & R	.3
12-8	Brake Lines—Bleed	.3
12-9	Brake Pedal—Adjustment	.1
12-10	Brake Shoes—R & R	1.4
12-11	Brake Shoes—Reline (Per Set (Two))	.3
12-12	Brake Shoes—Reline—Bonded (Per Set)	.1
12-13	Hand Brake—Adjustment	.2

Brakes—Repair Code 12—Continued

Operation	Description	Time
12-14	Master Cylinder—Overhaul (Per Cylinder)	.4
12-15	Master Cylinder—R & R	.4

Front Axle—Wheels—Controls and Linkage—Repair Code 13

Operation	Description	Time
13-1	Steer Axle Box Assembly—R & R	1.0
13-2	Steer Column and Case—Overhaul	.7
13-3	Steer Column and Case—R & R	.7
13-4	Steer Shaft—R & R	.3
13-5	Steer Shaft Universal Joints—R & R	.2
13-6	Steer Wheel—Bearings and Seals—Check and Service (Both Wheels)	.6
13-7	Steer Wheels—R & R—Pneumatic or Solid (Both Wheels)	.8
13-8	Steer Worm and Gear Assembly—R & R	1.5
13-9	Vertical Spindle—R & R	1.8

Power Steering

Operation	Description	Time
13-10	Cylinder, Steering, Air Booster—R & R	.8
13-11	Valve Assembly, Control—R & R	.5
13-12	Valve, Relief—R & R	.3
13-13	Pump, Hydraulic—R & R	.5
13-14	Flexible Oil Line—R & R	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time
16-1	Tire—Drive Wheels—Pneumatic—Dual Type (Inner) (Per Tire)	1.2
16-2	Tire—Drive Wheels—Pneumatic—Dual Type (Outer) (Per Tire)	.9
16-3	Tire—Drive Wheels—Retire—Solid (Both Wheels)	1.3
16-4	Tire—Steer Wheels—Pneumatic—Single Type (Per Tire)	.8
16-5	Tire—Steer Wheels—Solid (Both Wheels)	1.3

Hood—Fenders and Body—Repair Code 18

Operation	Description	Time
18-1	Dash Panel Cover—R & R	.6
18-2	Fenders (R or L)—R & R (Per Fender)	.3
18-3	Radiator Support (R or L)—R & R (Both Sides)	.8
18-4	Seat and Hood Cover Assembly—R & R	.4
18-5	Side Plates (R or L)—R & R	.1

Battery—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	.3
37-2	Battery Ground Cable—R & R	.3

TIME STANDARDS—Continued

Cable System—Repair Code 62

Operation	Description	Time
62–1	Boom Extension—Extend or Reduce	.7
62–2	Boom Hinge Pins—R & R (Both Pins)	.6
62–3	Boom Hoist and Hook Cable—R & R	2.4
62–4	Boom Limit Control—Adjust	.1
62–5	Boom Structure—R & R	1.0
62–6	Boom Topping Cable—R & R	2.4
62–7	Load Block—Overhaul	.6
62–8	Load Block—R & R	.7
62–9	Mast Assembly—R & R	3.8
62–10	Sheaves—Rebush	.5
62–11	Sheave and/or Sheave Pins—R & R	.5
62–12	Topping Yoke Cover—R & R	.1
62–13	Yoke—Sheave Topping—R & R	1.0

Hoist and Winch Assemblies—Repair Code 85

Operation	Description	Time
85–1	Boom Hoist Unit Drive—Overhaul	3.0
85–2	Boom Hoist Unit Drive—R & R	5.9
85–3	Boom Topping Unit Drive—Overhaul	3.0

Hoist and Winch Assemblies—Repair Code 85—Continued

Operation	Description	Time
85–4	Boom Topping Unit Drive—R & R	8.2
85–5	Brake—Topping—Adjust	.2
85–6	Clutch—Topping Unit—Adjust	.2
85–7	Control Levers and Linkage—R & R	1.2
85–8	Final Drive Gear—R & R	5.0
85–9	Hoist Unit Brake—Adjust	.2
85–10	Hoist Unit Clutch—Adjust	.2
85–11	Main Drive Belts—Adjust	.2
85–12	Main Drive Belts—R & R	.7
85–13	Slewing Drive Roller Chain—Adjust	.2
85–14	Slewing Drive Roller Chain—R & R	.4
85–15	Slewing Transmission—Overhaul	2.0
85–16	Slewing Transmission—R & R	1.9
85–17	Slewing Transmission—Brake—Adjust	.2
85–18	Slewing Transmission Clutch—Adjust	.2
85–19	Winch Drive Pulleys—R & R	.8
85–20	Winch Drive Universal Joints—Overhaul	.2
85–21	Winch Drive Universal Joints—R & R	.3
85–22	Worm Gear — Cone — Spacers — Sprockets — R & R	3.5

Section 5—Equipment Maintenance Code 1220

CRANE TRUCK, WAREHOUSE, ELECTRIC, SRT

REPAIR CODES

09—Drive Shaft and Universal Joints
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
37—Battery
50—Motors—Electric
52—Controls—Electric
62—Boom Structure
85—Hoist and Winch Assemblies

BASIC STANDARDS—EM Code 1220

		Standard Time
A	Block up Front or Rear	.1
B	Support Boom Structure	.3

TIME STANDARDS

Drive Shaft and Universal Joints—Repair Code 09

Operation	Description	Time
09-1	Drive Shafts—R & R (per Wheel)	.2
09-2	Universal Joints—Wheel—R & R (Per Wheel)	.2

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11-1	Differential Assembly—Inspect and Service (out of unit)	.5
11-2	Differential Assembly—Overhaul	3.8
11-3	Differential Assembly—R & R	3.6
11-4	Drive Yoke—R & R	.4
11-5	Oldham Coupling—R & R	.7
11-6	Power Axle—R & R	2.4
11-7	Torque Yoke—R & R	.4
11-8	Wheels—Drive—R & R (Two Wheels)	.4
11-9	Wheel Bearings—Repack—Service (Two Wheels)	.6

Brakes—Repair Code 12

Operation	Description	Time
12-1	Brake Linkage—R & R	.5
12-2	Brake Linkage—Tighten and Adjust	.3
12-3	Brake Pedal—R & R	.4
12-4	Brake Pedal Spring—R & R	.1
12-5	Drive Motor Brake Spring—R & R	.4
12-6	Travel Brakes—Adjust	.2
12-7	Travel Brakes—Timing	.2
12-8	Travel Brake Shoes—R & R	.5
12-9	Travel Brake Shoes—Reline (Per Set)	.1
12-10	Travel Brake Shoes—Reline—Bonded (Per Set)	.2

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13-1	Axle Springs—R & R (Both Sides of Power or Powerless Axle)	.8
13-2	Ball Joints—Tighten and Service (Per Joint)	.1
13-3	Steer—Bell Crank Bearings—R & R	.4
13-4	Steer Gear Case and Post—Overhaul	1.5
13-5	Steer Gear Case and Post—R & R	.9
13-6	Steer Knuckles and Yoke—R & R	.6
13-7	Steering Levers—R & R—Bearings (Per Lever)	.4
13-8	Tie Rods—R & R (Per Rod)	.4
13-9	Wheel Bearings—Repack—Service (Two Wheels)	.6
13-10	Wheels—Steer—R & R (Two Wheels)	.4

Power Steering

Operation	Description	Time
13-11	Cylinder, Steering, Air Booster—R & R	.8
13-12	Valve Assembly, Control—R & R	.5
13-13	Valve, Relief—R & R	.3
13-14	Pump, Hydraulic—R & R	.5
13-15	Flexible Oil Line—R & R	.2
13-16	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time
16-1	Tire—Drive Wheels—Solid (Two Wheels)	.8
16-2	Tire—Steer Wheels—Solid (Two Wheels)	.8

Battery—R & R—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	.3
37-2	Battery Plug—R & R	.5
37-3	Charging Plug—R & R	.5

Motors—Electric—Repair Code 50

Operation	Description	Time
50-1	Boom Hoist Motor—Clean and Service	.2
50-2	Boom Hoist Motor—R & R (Two Man Operation)	3.1
50-3	Boom Hoist Motor Wires—R & R	.9
50-4	Hoist Unit Motor—Clean and Service	.2
50-5	Hoist Unit Motor—R & R (Two Man Operation)	3.0
50-6	Hoist Unit Motor Wires—R & R	.9
50-7	Slew Assembly (Motor and Gear Reduction)—R & R	1.6
50-8	Slew Motor—Clean and Service	.3
50-9	Slew Motor Wires—R & R	.9
50-10	Travel Motor—Clean	.3
50-11	Travel Motor—R & R	1.2
50-12	Travel Motor Wires—R & R	.4

Control—Electric—Repair Code 52

Operation	Description	Time
52-1	Boom Hoist Contactors—R & R	.3
52-2	Boom Hoist Control Switch—Clean and Inspect	.2
52-3	Boom Hoist Control Switch—R & R	.3
52-4	Boom Hoist Limit Switch—R & R	.3
52-5	Boom Hoist Limit Switch Contacts—R & R	.3
52-6	Contactor Springs—R & R	.2

TIME STANDARDS—Continued

Control—Electric—Repair Code 52—Continued

Operation	Description	Time
52–7	Contactor Tips—R & R	.2
52–8	Electrical Interlock—R & R	.3
52–9	Electrical Interlock Tips—R & R	.2
52–10	Hoist Unit Contactors—R & R	.3
52–11	Hoist Unit Control Switch—Clean and Inspect	.2
52–12	Hoist Unit Control Switch—R & R	.3
52–13	Hoist Unit Limit Switch—R & R	.3
52–14	Limit Switch Contacts—R & R	.3
52–15	Pedal Contact Switch (Segment Contacts) R & R	.2
52–16	Slew Unit Contactor—R & R	.3
52–17	Slew Unit Control Switch—Clean and Inspect	.2
52–18	Slew Unit Control Switch—R & R	.3
52–19	Slew Unit Limit Switch—R & R	.3
52–20	Slew Unit Limit Switch Contacts—R & R	.3
52–21	Slew Unit Resistor—R & R	.8
52–22	Travel Controller (Contact Segments)—R & R	.3
52–23	Travel Unit Contactor—R & R	.3
52–24	Travel Unit Controller—Clean and Inspect	.5
52–25	Travel Unit Resistor—R & R	.4
52–26	Hour-Meter—R & R	.3
52–27	Horn—R & R	.3
52–28	Horn Button—R & R	.3
52–29	Battery Flush	.3
52–30	Battery Cable Lug Resolder	.5

Boom Structure—Repair Code 62

Operation	Description	Time
62–1	Block and Hook Assembly—Overhaul	.6
62–2	Block and Hook Assembly—R & R	.7
62–3	Boom—Hinge Pin—R & R	.5

Boom Structure—Repair Code 62—Continued

Operation	Description	Time
62–4	Boom Hinge Pin Bushings—R & R (Both Bushings)	.7
	One Bushing	(.5)
62–5	Boom Structure—R & R	1.0
62–6	Boom—Topping Block—R & R	.9
62–7	Boom Topping Cable—R & R (Two Man Operation)	3.8
62–8	Boom—Topping Sheave Block—R & R	.9
62–9	Boom Topping Striker—R & R	.2
62–10	Cable Retainer Pins—R & R (Per Pin)	.4
62–11	Hoist Cable—R & R (Two Man Operation)	4.3
62–12	Hoist Cable Sheaves—R & R	.7
62–13	Hoist Striker—R & R	.6
62–14	Topping Support Strap—R & R	.9
62–15	Wire Reel—R & R	.6

Hoist and Winch Assemblies—Repair Code 85

Operation	Description	Time
85–1	Boom Hoist Gear Assembly—Overhaul	3.5
85–2	Boom Hoist Gear Assembly—R & R (Two Man Operation)	5.2
85–3	Boom Hoist Magnetic Brake—R & R	1.0
85–4	Boom Hoist Mercury Brake—R & R	.5
85–5	Hoist Unit Gear Assembly—Overhaul	3.5
85–6	Hoist Unit Gear Assembly—R & R (Two Man Operation)	4.6
85–7	Hoist Unit Magnetic Brake—R & R	.4
85–8	Slew Gear Assembly—Overhaul	2.6
85–9	Slew Gear Assembly—R & R	1.6
85–10	Slew Unit Magnetic Brake—R & R	1.0

Section 6—Equipment Maintenance Code 1230

CRANE, TRUCK, MAGAZINE, ELECTRIC, SPARK ENCLOSED, SRT

REPAIR CODES

09—Drive Shaft and Universal Joints
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
37—Battery
50—Motors—Electric
52—Controls—Electric
62—Boom Structure
85—Hoist and Winch Assemblies

BASIC STANDARDS—EM Code 1230

		Standard Time
A	Block Up Crane—Regular	.1
B	Block Up Crane for Rear End	.3
C	Support Boom Structure	.3

TIME STANDARDS

Drive Shaft and Universal Joints—Repair Code 09

Operation	Description	Time
09–1	Drive Shafts—R & R (Per Wheel)	.2
09–2	Universal Joints—R & R (Per Wheel)	.2

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11–1	Differential Assembly—Inspect and Service (Out of Unit)	.5
11–2	Differential Assembly—Overhaul	3.5
11–3	Differential Assembly—R & R	3.0
11–4	Drive Yoke—R & R	.4
11–5	Power Axle—R & R	2.3
11–6	Torque Yoke—R & R	.4
11–7	Wheels, Drive—R & R (Two Wheels)	.4
11–8	Wheel Bearings—Repack, Service (Two Wheels)	.6

Brakes—Repair Code 12

Operation	Description	Time
12–1	Brake Linkage—R & R	.5
12–2	Brake Linkage—Tighten and Adjust	.3
12–3	Brake Pedal—R & R	.4
12–4	Drive Motor Brake Spring—R & R	.4
12–5	Travel Brakes—Adjust	.2
12–6	Travel Brake Shoes—R & R	.5
12–7	Travel Brake Shoes—Reline (Per Set)	.1
12–8	Travel Brake Shoes, Bonded—Reline (Per Set)	.2

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13–1	Axle Springs—R & R	.8
13–2	Ball Joints—Tighten and Service (Per Joint)	.1
13–3	Steer Bell Crank Bearings—R & R	.4
13–4	Steer Gear Case and Post—Overhaul	1.5
13–5	Steer Gear Case and Post—R & R	.8
13–6	Steer Knuckles and Yoke—R & R	.6
13–7	Tie Rods—R & R (Per Rod)	.4
13–8	Wheel Bearings—Repack—Service (Two Wheels)	.6
13–9	Wheels, Steer—R & R (Two Wheels)	.4

Tires—Repair Code 16

Operation	Description	Time
16–1	Tire, Drive Wheels, Solid—R & R (Two Wheels)	.8
16–2	Tire, Steer Wheels, Solid—R & R (Two Wheels)	.8

Battery—Repair Code 37

Operation	Description	Time
37–1	Battery—R & R	.3
37–2	Battery Plug—R & R	.4
37–3	Charging Plug—R & R	.4

Motors—Electric—Repair Code 50

Operation	Description	Time
50–1	Boom Hoist Motor—Clean and Service	.2
50–2	Boom Hoist Motor—R & R (Two Man Operation)	3.0
50–3	Boom Hoist Motor Wires—R & R	.9
50–4	Hoist Unit Motor—Clean and Service	.2
50–5	Hoist Unit Motor—R & R (Two Man Operation)	2.8
50–6	Hoist Unit Motor Wires—R & R	.9
50–7	Slew Assembly—R & R	1.6
50–8	Slew Motor—Clean and Service	.2
50–9	Slew Motor Wires—R & R	.9
50–10	Travel Motor—Clean	.2
50–11	Travel Motor—R & R	1.5

Controls—Electric—Repair Code 52

Operation	Description	Time
52–1	Boom Hoist Contactors—R & R	.3
52–2	Boom Hoist Control Switch—Clean and Inspect	.2
52–3	Boom Hoist Control Switch—R & R	.3
52–4	Boom Hoist Limit Switch—R & R	.3
52–5	Boom Hoist Limit Switch Contacts—R & R	.3
52–6	Contactor Springs—R & R	.2
52–7	Contactor Tips—R & R	.2
52–8	Hoist Unit Contactors—R & R	.3
52–9	Hoist Unit Control Switch—Clean and Inspect	.2
52–10	Hoist Unit Control Switch—R & R	.3
52–11	Hoist Unit Limit Switch—R & R	.3
52–12	Hoist Unit Limit Switch Contacts—R & R	.3
52–13	Pedal Contact Switch—R & R	.2
52–14	Slew Unit Contactor—R & R	.3

TIME STANDARDS—Continued

Controls—Electric—Repair Code 52—Continued

Operation	Description	Time
52–15	Slew Unit Control Switch—Clean and Inspect	.2
52–16	Slew Unit Control Switch—R & R	.3
52–17	Slew Unit Limit Switch—R & R	.3
52–18	Slew Unit Limit Switch Contacts—R & R	.3
52–19	Slew Unit Resistor—R & R	.8
52–20	Travel Controller Contact Segments—R & R	.3
52–21	Travel Unit Contactor—R & R	.3
52–22	Travel Unit Controller—Clean and Inspect	.5
52–23	Travel Unit Resistor—R & R	.3
52–24	Hour-Meter—R & R	.3
52–25	Horn—R & R	.3
52–26	Horn Button—R & R	.3
52–27	Battery Flush	.3
52–28	Battery Cable Lug Resolder	.3

Boom Structure—Repair Code 62

Operation	Description	Time
62–1	Block and Hook Assembly—Overhaul	.6
62–2	Block and Hook Assembly—R & R	.7
62–3	Boom Hinge Pin—R & R	.5
62–4	Boom Hinge Pin Bushings—R & R	.7
62–5	Boom Structure—R & R	1.0
62–6	Boom Topping Block—R & R	.9

Boom Structure—Repair Code 62—Continued

Operation	Description	Time
62–7	Boom Topping Cable—R & R (Two Man Operation)	3.8
62–8	Boom Topping Sheave Block—R & R	.9
62–9	Boom Topping Striker—R & R	.2
62–10	Cable Retainer Pins—R & R (Per Pin)	.4
62–11	Hoist Cable—R & R (Two Man Operation)	4.3
62–12	Hoist Cable Sheaves—R & R	.7
62–13	Hoist Striker—R & R	.6
62–14	Wire Reel—R & R	.6

Hoist and Winch Assemblies—Repair Code 85

Operation	Description	Time
85–1	Boom Hoist Gear Assembly—Overhaul	3.5
85–2	Boom Hoist Gear Assembly—R & R (Two Man Operation)	5.0
85–3	Boom Hoist Brake—R & R	1.0
85–4	Hoist Unit Gear Assembly—Overhaul	3.5
85–5	Hoist Unit Gear Assembly—R & R (Two Man Operation)	4.6
85–6	Hoist Unit Brake—R & R	.4
85–7	Slew Gear Assembly—Overhaul	2.5
85–8	Slew Gear Assembly—R & R	1.6
85–9	Slew Unit Brake—R & R	1.0

Section 7—Equipment Maintenance Code 1240

CRANE, GAS-ELECTRIC, SRT (ALL CAPACITIES)

REPAIR CODES

01—Engine
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
37—Battery

BASIC STANDARDS—EM Code 1240

		Standard Time
A	Upper Panel, Front or Rear—R & R	.1
B	Lower Front Panel—R & R	.1
C	Lower Rear Panel—R & R	.2
D	Top Plate—R & R	.2
E	Radiator End Plate—R & R	.1
F	Generator End Plate—R & R	.1
G	Engine—Unit Complete, R & R	.6
H	Engine Unit—Loosen and Shift on Crane Unit	.2

TIME STANDARDS

Operation	Description	Time — Models: 4 Cyl.	Time — Models: 6 Cyl.
01-1	Engine—Bore for Sleeves	9.5	13.2
01-2	Engine—Bore Oversize	5.4	6.7
01-3	Engine—Disassemble	2.3	2.5
01-4	Engine—Dynamometer Test	2.2	2.2
	NOTE: In this standard full attention is not required for the 3¼ hours run-in time. The standard includes .6 hours for attention and check of operating results.		
01-5	Engine—Head Block and/or Gasket—R & R	1.6	1.6
01-6	Engine—R & R	.6	.6
01-7	Engine—Reassemble	8.5	9.5
01-8	Engine—Tappets—Adjust	2.0	2.6
01-9	Engine—Tune Up	1.	1.1
01-10	Engine—Valve Springs—R & R	2.8	2.8
01-11	Oil Gauge—R & R	.5	.5
03-1	Air Filter—R & R	.2	.2
03-2	Carburetor—Governor—Adjust	.4	.4
03-3	Carburetor—Overhaul	.5	.5
03-4	Carburetor—R & R	.7	.7
03-5	Fuel Pump—Overhaul	.4	.4
03-6	Fuel Pump—R & R	.7	.7
03-7	Gas Filter—R & R	.2	.2
03-8	Gas Gauge—R & R	.5	.5
03-9	Gas Tank—R & R	.7	.7
04-1	Exhaust Pipe—R & R	.6	.6
04-2	Heat Control Thermostat—R & R	1.6	1.6
04-3	Intake and Exhaust Section Gasket—R & R	1.6	1.6
04-4	Manifold and/or Gasket—R & R	1.5	1.5
04-5	Muffler—R & R	.3	.3
05-1	Fan Belt—R & R	.4	.4
05-2	Fan Blade—R & R	1.7	1.7
05-3	Head Water Outlet Gasket—R & R	.7	.7
05-4	Radiator—R & R	1.6	1.6
05-5	Radiator Hose—Lower—R & R	.6	.6
05-6	Radiator Hose—Upper—R & R	.4	.4
05-7	Radiator Hoses—Both—R & R	.7	.7

TIME STANDARDS—Continued

Operation	Description	Time	
		Models	
		4 Cyl.	6 Cyl.
05-8	Temperature Gauge—R & R	.5	.5
05-9	Water Pump—R & R	.7	.7
05-10	Cooling System—Flush	.5	.5
06-1	Ammeter—R & R	.5	.5
06-2	Coil Ignition—R & R	.4	.4
05-3	Distributor—Overhaul	.5	.5
06-4	Distributor—R & R	.6	.6
06-5	Generator—Adjust	.5	.5
06-6	Generator—R & R	.6	.6
06-7	Idling Control Relay—R & R	.5	.5
06-8	Ignition Switch—R & R	.5	.5
06-9	Instrument Panel—Rewire	.9	.9
06-10	Main Generator—Adjust—Service	1.0	1.0
06-11	Main Generator—R & R	1.6	1.6
06-12	Solenoid Switch—R & R	.5	.5
06-13	Spark Plug Wires—R & R	.6	.6
06-14	Spark Plugs—R & R	.4	.4
06-15	Starter Motor—R & R	.7	.7
06-16	Switch Cable to Battery or Starter Motor—R & R	.5	.5
06-17	Vacuum Switch—R & R	.5	.5
06-18	Voltage Regulator—R & R	.5	.5
06-19	Hour Meter—R & R	.3	.3
06-20	Horn—R & R	.3	.3
06-21	Horn Button—R & R	.3	.3
37-1	Battery—R & R	.4	.4
37-2	Battery Ground Cable—R & R	.4	.4

TRUCK, LIFT, FORK, GAS

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
18—Hood—Fenders—Body
37—Battery
63—Hydraulic System
85—Hoist—Winch Assemblies

BASIC STANDARDS—EM Codes 1300–1310–1320

		Standard Time
A	Lift Forks—R & R	.2
B	Safety Rack—R & R	.5
C	Mast—R & R (Includes Operations A & B)	2.0
D	Mast—(Lay on floor without removing, including Operation A & B)	1.0
E	Floor Board—R & R	.2
F	Side Panels—R & R	.4
G	Floor Board and Side Panels—R & R	.5
H	Gas Tank Cover—R & R	.3
I	Gas Tank—R & R (Includes Operation H)	.6
J	Hydraulic Tank and Seat Frame—R & R (Includes Operations E & I)	2.0
K	Block Up Rear End	.1
L	Block Up Front End	.1

TIME STANDARDS

		Time			
		Models			
		SRT		PRT	
		Up to:			
Operation	Description	4M#	6M#	6M#	15M#
01–1	Engine—Bore for Sleeves	9.7	13.2	13.2	13.2
01–2	Engine—Bore Oversize	6.6	7.6	7.6	7.8
01–3	Engine—Disassemble	2.5	2.7	2.6	2.9
01–4	Engine—Dynamometer Test	2.2	2.2	2.2	2.2
	NOTE: In this standard, full attention is not required for the 3¼ hours run-in time. The standard includes .6 hour for attention and check of operating results.				
01–5	Engine—R & R	8.1	8.3	8.4	9.4
01–6	Engine—Reassemble	7.6	8.7	8.7	8.9
01–7	Engine—Replace Head or Gasket	1.1	1.2	1.3	1.5
01–8	Engine—Replace Valve Spring	.9	2.5	2.5	2.5
01–9	Valve Job Complete	7.5	8.0	9.0	12.0
01–10	Valve Side Cover Gasket	.6	.6	.8	1.4
01–11	Engine—Tappets—Adjust	1.2	2.8	2.8	2.8
01–12	Engine—Timing Gear Cover or Gasket—R & R	8.2	8.2	8.2	8.4
01–13	Engine—Tune-Up	.9	1.0	1.0	1.0
01–14	Engine Tune-Up Minor	1.5	1.5	1.5	2.0
01–15	Engine Tune-Up Major	2.0	2.0	2.0	2.5
01–16	Engine Mount Springs (Both Sides)—R & R	.5	.5	.7	.8
01–17	Engine Mount Springs (One Side)—R & R	.4	.4	.5	.5
01–18	Oil Gauge—R & R	.4	.4	.4	.4
01–19	Accessory Drive—R & R	....	2.3	....	....
01–20	Accessory Drive—Overhaul	....	1.5	....	....
02–1	Clutch—Adjust	.2	.2	.2	.3
02–2	Clutch Facing—Reline	.4	.4	.4	.4
02–3	Clutch Pedal Springs—R & R	.1	.3	.3	.3
02–4	Flywheel—R & R	4.9	4.8	4.9	4.9
02–5	Flywheel Ring Gear—Install	.2	.1	.1	.2

TIME STANDARDS—Continued

Operation	Description	Time			
		Models			
		SRT		PRT	
		Up to:			
		4M#	6M#	6M#	15M#
02–6	Flywheel Reface	1.0	1.0	1.0	2.0
02–7	Pressure Plate—Facing and Release Bearing—R & R	2.8	3.9	4.0	4.1
02–8	Pressure Plate—Overhaul	.7	.7	.7	.8
03–1	Accelerator Spring—R & R	.2	.1	.1	.1
03–2	Air Filter—Clean	.1	.1	.1	.1
03–3	Carburetor—Overhaul	.6	.6	.6	.6
03–4	Carburetor—R & R	.4	.4	.4	.4
03–5	Choke Assembly—R & R	.5	.5	.5	.6
03–6	Carburetor and Governor—Adjust	.2	.2	.2	.2
03–7	Carburetor Return Spring—R & R	.1	.1	.1	.1
03–8	Fuel Filter—Clean	.1	.1	.1	.1
03–9	Fuel Gauge—R & R	.4	.4	.4	.4
03–10	Fuel Pump—Overhaul	....	.4	.4	.4
03–11	Fuel Pump—R & R	.1	.5	.5	.5
03–12	Fuel Tank—R & R	.7	.7	.7	.7
04–1	Exhaust Pipe and Gasket—R & R	.6	.8	.7	.8
04–2	Exhaust Pipe Gasket—R & R	.3	.5	.5	.6
04–3	Heat Control Thermostat—R & R		.1	.1	.2
04–4	Intake and Exhaust Section Gasket—R & R	.5	1.1	1.1	1.1
04–5	Manifold and/or Gasket—R & R	1.3	1.7	1.8	1.8
04–6	Muffler—R & R	.6	.7	.6	.7
04–7	Muffler, Exhaust Pipe and Gasket—R & R	.8	1.0	1.0	1.0
05–1	Engine Drain Cock—R & R	.2	.2	.2	.2
05–2	Fan Belt—R & R	.2	.1	.1	.2
05–3	Fan Belt—Adjust	.1	.1	.7	.4
05–4	Fan Blade—R & R	.3	.4	.4	.3
05–5	Head Water Outlet Gasket—R & R	.3	.3	.3	.4
05–6	Radiator—R & R	1.4	1.3	1.4	1.7
05–7	Radiator Drain Cock—R & R	.1	.1	.1	.2
05–8	Radiator Hose—Lower—R & R	.3	.3	.3	.3
05–9	Radiator Hose—Upper—R & R	.2	.2	.2	.2
05–10	Water Pump—Overhaul	.6	.6	.6	.7
05–11	Water Pump—R & R	1.5	1.5	1.5	1.6
05–12	Cooling System—Flush	1.0	1.0	1.0	1.0
05–13	Temperature Gauge—R & R	.4	.4	.4	.4
06–1	Ammeter—R & R	.4	.4	.4	.4
06–2	Coil—R & R	.2	.2	.2	.2
06–3	Dash Panel—Rewire	.9	.9	.9	1.1
06–4	Distributor—Overhaul	.7	.6	.6	.7
06–5	Distributor—R & R	.2	.2	.2	.2
06–6	Generator—Adjust	.2	.2	.2	.2
06–7	Generator—R & R	.4	.4	.3	.5
06–8	Generator Belt—R & R	.....	.....	.8	.8
06–9	Horn—R & R or Adjust	.3	.3	.3	.3

TIME STANDARDS—Continued

Operation	Description	Time			
		Models			
		SRT		PRT	
		Up to:			
		4M#	6M#	6M#	15M#
06-10	Horn Button—R & R	.1	.1	.1	.1
06-11	Horn Wire to Button—R & R	.2	.2	.2	.2
06-12	Ignition Switch—R & R	.4	.4	.4	.4
06-13	Spark Plugs—R & R	.2	.4	.4	.4
06-14	Spark Plug Wires—R & R	.3	.4	.4	.4
06-15	Starter—R & R	.6	.6	.6	.6
06-16	Starter—Overhaul	1.3	1.3	1.3	1.3
06-17	Starter Cable—R & R	.2	.2	.2	.3
06-18	Starter Switch—R & R	.5	.5	.5	.5
06-19	Starter Switch to Battery Cable—R & R	.2	.2	.2	.2
06-20	Voltage Regulator—Adjust	.3	.3	.3	.3
06-21	Voltage Regulator—R & R	.3	.3	.3	.3
06-22	Hour Meter—R & R	.3	.3	.3	.3
06-23	Voltage Regulator—Overhaul	1.0	1.0	1.0	1.0
06-24	Fuse Holder—R & R	.5	.5	.5	.5
07-1	Ring and Pinion Gear Assembly—Overhaul	1.0	1.0	1.0	1.0
07-2	Transmission—Overhaul	5.1	5.1	3.4	4.8
07-3	Transmission Shifting Link—R & R	.5	.....	.....	.....
07-4	Transmission Shifting Pall—R & R	....	1.0	....	....
07-5	Transmission—R & R	4.4	4.3	3.8	4.1
07-6	Transmission—Replace Grease Seals and Inspect	1.4	1.4	1.6	1.6
07-7	Transmission Shifting Rail Seals—R & R	....	1.0	....	....
	Automatic Transmission				
07-8	Automatic Transmission—R & R	3.5	3.5	3.5	3.6
07-9	Automatic Transmission Oil Filter—R & R	....	0.8	....	....
07-10	Automatic Transmission Oil Pump—R & R (Add Automatic Transmission R & R for Front Pump)	1.8	1.8	1.8	1.8
07-11	Automatic Transmission Housing Oil Seal—R & R	1.0	1.0	1.0	1.3
07-12	Automatic Transmission Governor Assembly—Recondition	1.8	1.8	1.8	1.8
09-1	Universal Joint—R & R	....	....	.6	.6
09-2	Sprocket Coupling Chain—R & R	.5	....	....	....
09-3	Universal Joint—Replace Bearings	....	....	1.1	1.1
11-1	Differential Assembly—Overhaul	....	....	2.9	3.2
11-2	Differential Assembly—R & R	....	....	3.1	3.2
11-3	Differential "U" Bolt—R & R	.5	....	....	....
11-4	Differential and Transmission Assembly—Overhaul	11.0	11.0	....	....
11-5	Rear Axle—R & R	1.6	1.6	1.8	1.8
11-6	Wheels—Drive—R & R	.7	.7	1.0	1.0
11-7	Wheels—Drive—Pack Bearings	.4	.4	.4	.5
11-8	Differential Pinion Drive Seal	3.5	2.0	2.0	2.0
12-1	Adjustment—Major	.9	.9	1.0	1.2
12-2	Adjustment—Minor	.4	.4	.4	.4
12-3	Brake Cylinder—Overhaul (out of unit) (Per Cylinder)	.3	.3	.3	.4

TIME STANDARDS—Continued

Operation	Description	Time			
		Models			
		SRT		PRT	
		Up to:			
		4M#	6M#	6M#	15M#
12–4	Brake Cylinder—R & R	1.4	1.4	1.4	1.5
12–5	Brake Line—Central—R & R	.2	.2	.2	.2
12–6	Brake Lines—Bleed	.6	.5	.3	.3
12–7	Brake Line—L or R—R & R	.7	.7	.3	.3
12–8	Brake Pedal—Adjust	.2	.2	.2	.2
12–9	Brake Pedal Springs—R & R	.1	.3	.3	.3
12–10	Brake Shoe—Bonded—Reline	.3	.3	.3	.3
12–11	Brake Shoes—R & R	1.5	1.4	1.5	1.6
12–12	Brake Shoes—Reline (Per Wheel)	.3	.3	.3	.3
12–13	Hand Brake—Adjust	.3	.3	.3	.3
12–14	Hand Brake Band—Reline	.2	.2	.2	.3
12–15	Master Cylinder—Overhaul—(out of unit)	.4	.4	.4	.5
12–16	Master Cylinder—R & R	.5	.5	.5	.5
12–17	Micro Brake Unit—R & R	1.1	....	....	.8
13–1	Steer Wheels—Repack	.6	.6	.6	.7
13–2	Steering—Inspect	.3	.3	.3	.3
13–3	Steering Assembly—Overhaul	2.0	2.2	2.2	2.7
13–4	Steering Assembly—R & R	1.8	1.8	1.7	1.8
13–5	Steering Axle Drag Link—R & R	.7	.7	.7	.7
13–6	Steering Axle Spring (One)—R & R	2.1	2.1	....	....
13–7	Steering Gear—Overhaul	1.1	1.1	1.1	1.1
13–8	Steering Gear—R & R	1.1	1.2	1.2	1.2
13–9	Steering Wheel—R & R	.3	.3	.3	.3
	Power Steering:				
13–10	Cylinder, Steering, Air Booster—R & R	....	....	.8	1.0
13–11	Valve Assembly, Control—R & R	....	....	.5	.5
13–12	Valve, Relief—R & R	....	....	.3	.3
13–13	Pump, Hydraulic—R & R	....	....	.5	.5
13–14	Flexible Oil Line—R & R	....	....	.2	.2
13–15	Hose, Hydraulic, Gear Pump to Control Valve—R & R	....	....	.3	.2
16–1	Drive Wheels—Retire—Solid—Pneumatic	.8	.8	1.4	1.4
16–2	Front Wheels—Steering—Retire—Solid—Pneumatic	.7	.7	.7	.7
18–1	Floor Board—R & R	.2	.2	.2	.2
18–2	Gas Tank Cover—R & R	.3	.3	....	....
18–3	Hydraulic Tank and Seat Frame—R & R	2.0	2.0	2.0	2.0
18–4	Safety Rack—R & R	.5	.5	.5	.5
18–5	Seat Spring—R & R	....	.2	....	....
18–6	Side Panels—R & R	....	.4	....	....
37–1	Battery—R & R	.2	.2	.2	.2
37–2	Battery Ground Cable—R & R	.2	.1	.2	.2

TIME STANDARDS—Continued

Operation	Description	Time			
		Models			
		SRT		PRT	
		Up to:			
		4M#	6M#	6M#	15M#
63–1	Hydraulic Oil Tank—R & R	1.1	1.2	1.2	1.3
63–2	Hydraulic Pump and/or Gasket—R & R	1.0	1.4	1.0	1.2
63–3	Lift Cylinder—Overhaul	2.6	2.7	2.7	2.8
63–4	Lift Cylinder to Tank Line—R & R	.6	.6	.6	.6
63–5	Mast and Lift Cylinder—Overhaul	6.5	7.0	7.0	8.0
63–6	Pump to Valve Hydraulic Line—R & R	.4	.4	.5	.7
63–7	Tank to Pump Hydraulic Line—R & R	.8	.8	.8	.9
63–8	Tilt Cylinder—Overhaul (in unit)	.8	.8	.9	.9
63–9	Tilt Cylinder—Overhaul (out of unit)	.7	.7	.7	.7
63–10	Tilt Cylinder Crossover Line (Front)—R & R	.5	.5	.5	.5
63–11	Tilt Cylinder Crossover Line (Rear)—R & R	.5	.5	.5	.5
63–12	Tilt Cylinder Gland—Repack (in unit)	.5	.5	.5	.5
63–13	Valve—R & R	.7	.7	.7	.8
63–14	Valve to Lift Cylinder Line—R & R	.4	.4	.4	.4
63–15	Valve to Tank Hydraulic Line—R & R	.5	.5	.5	.5
63–16	Valve to Tilt Cylinder (Front) Line—R & R	.5	.5	.5	.5
63–17	Valve to Tilt Cylinder (Rear) Line—R & R	.5	.5	.5	.5
63–18	Crankshaft Pulley and Coupler—R & R	2.5	....	....	....
85–1	Carrier Roller	1.5	2.4	1.5	4.0
85–2	Carrier Roller (Spacer Blocks)—R & R	1.3	....	....	....
85–3	Fork Lock Pin—R & R	.3	.1	.5	.1
85–4	Upright Support Bushings—R & R	2.5	2.5	....	....

TRUCK, LIFT, FORK, DIESEL

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle; Wheels, Controls
16—Tires
18—Hood, Fenders, Body
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Codes 1330, 1340, 1350

		Standard Time
A	Lift Forks—R & R	.2
B	Safety Rack—R & R	.5
C	Mast—R & R (Includes Operations A & B)	2.0
D	Floor Board—R & R	.2
E	Side Panels—R & R	.4
F	Floor Board and Side Panels—R & R	.5
G	Fuel Tank Cover—R & R	.3
H	Fuel Tank—R & R (Includes Operation G)	.6
I	Block Up Rear End	.1
J	Block Up Front End	.1

TIME STANDARDS

Operation	Description	Time — All Models SRT	Time — All Models PRT
01–1	Compression Test (1 Cylinder)	.4	.4
01–2	Engine—Bore for Sleeves	13.2	13.2
01–3	Engine—Disassemble	2.3	2.3
01–4	Engine—Dynamometer test	2.2	2.2
01–5	Engine—R & R	7.7	7.7
01–6	Engine—Reassemble	8.5	8.5
01–7	Engine—Replace Head or Gasket	1.0	1.0
01–8	Engine—Rocker Arm Cover or Gasket—R & R	.4	.4
01–9	Engine—Timing Gear Cover or Gasket—R & R	8.2	8.2
01–10	Engine—Tune-Up	.8	.8
01–11	Engine Mount Springs—R & R	.4	.7
01–12	Oil Gage—R & R	.3	.3
02–1	Clutch—Adjust	.2	.2
02–2	Clutch Facing—Reline	.3	.3
02–3	Clutch Pedal Springs—R & R	.3	.3
02–4	Flywheel—R & R	4.6	4.4
02–5	Flywheel Ring Gear—Install	.1	.1
02–6	Pressure Plate—Facing and Release Bearing—R & R	3.7	3.5
02–7	Pressure Plate—Overhaul	.6	.6
03–1	Accelerator Spring—R & R	.1	.1
03–2	Air Filter—Clean	.1	.1
03–3	Filter, Fuel, Primary—Clean	.2	.2
03–4	Filter, Fuel, Secondary—Clean	.2	.2
03–5	Fuel Gage—R & R	.3	.3
03–6	Fuel Tank—R & R	.6	.6
03–7	Injector, Fuel—Remove, Test, and Replace	.6	.6
03–8	System, Fuel—Clean Complete	.5	.5
04–1	Exhaust Pipe and Gasket—R & R	.7	.7
04–2	Heat Control Thermostat—R & R	.1	.1
04–3	Exhaust Manifold and Gasket—R & R	1.4	1.4
04–4	Muffler—R & R	.6	.6
05–1	Engine Drain Cock—R & R	.1	.1
05–2	Fan Belt—R & R	.1	.1
05–3	Fan Blade—R & R	.2	.2

TIME STANDARDS—Continued

Operation	Description	Time	
		All Models	
		SRT	PRT
05-4	Head Water Outlet Gasket—R & R	.3	.3
05-5	Radiator—R & R	1.2	1.3
05-6	Radiator Drain Cock—R & R	.1	.1
05-7	Radiator Hose, Lower—R & R	.2	.2
05-8	Radiator Hose, Upper—R & R	.2	.2
05-9	Water Pump—Overhaul	.5	.5
05-10	Water Pump—R & R	1.4	1.4
05-11	Cooling System—Flush	1.0	1.0
05-12	Temperature Gage—R & R	1.0	1.0
06-1	Dash Panel—Rewire	.8	.8
06-2	Generator—Adjust	.2	.2
06-3	Generator—R & R	.3	.3
06-4	Horn—R & R or Adjust	.2	.2
06-5	Horn Button—R & R	.1	.1
06-6	Horn Wire to Button—R & R	.2	.2
06-7	Hour Meter—R & R	.3	.3
07-1	Ring and Pinion Gear Assembly—Overhaul	1.0	1.0
07-2	Transmission—Overhaul	4.7	4.7
07-3	Transmission—R & R	3.5	3.0
07-4	Transmission—Replace Grease Seals and Inspect	1.3	1.3
07-5	Automatic Transmission—R & R	3.4	3.4
07-6	Automatic Transmission Oil Pump—R & R (Add Automatic Transmission R & R for Front Pump)	1.8	1.8
07-7	Automatic Transmission Housing Oil Seal—R & R	1.0	1.0
07-8	Automatic Transmission Regulator Valve Body—R & R	3.4	3.4
07-9	Automatic Transmission Governor Assembly—Recondition	1.8	1.8
09-1	Universal Joint—R & R	.....	.5
09-2	Universal Joint—Replace Bearings	.....	1.0
11-1	Differential Assembly—Overhaul	.....	2.3
11-2	Differential Assembly—R & R	.....	3.0
11-3	Real Axle—R & R	1.5	1.8
11-4	Wheels, Drive—R & R	.5	.8
12-1	Adjustment—Major	.8	.8
12-2	Adjustment—Minor	.3	.3
12-3	Brake Cylinder—Overhaul (out of unit)	.3	.3
12-4	Brake Cylinder—R & R	1.3	1.3
12-5	Brake Line, Central—R & R	.2	.2
12-6	Brake Lines—Bleed	.5	.2
12-7	Brake Line, L or R—R & R	.7	.3
12-8	Brake Pedal—Adjust	.2	.2
12-9	Brake Shoes, Bonded—Reline	.2	.2
12-10	Brake Shoes—R & R	1.4	1.4
12-11	Brake Shoes—Reline (Per Wheel)	.3	.3
12-12	Hand Brake—Adjust	.3	.3
12-13	Hand Brake Band—Reline	.1	.1
12-14	Master Cylinder—Overhaul (out of unit)	.3	.3
12-15	Master Cylinder—R & R	.3	.3

TIME STANDARDS—Continued

Operation	Description	Time	
		All Models	
		SRT	PRT
13-1	Cylinder, Steering, Air Booster—R & R	.1	.8
13-2	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.....	.2
13-3	Line, Oil, Flexible—R & R	.....	.2
13-4	Pump, Hydraulic—R & R	.....	.5
13-5	Steer Wheels—Repack	.5	.5
13-6	Steering—Inspect	.3	.3
13-7	Steering Assembly—Overhaul	1.9	1.9
13-8	Steering Assembly—R & R	1.7	1.7
13-9	Steering Axle Drag Link—R & R	.6	.6
13-10	Steering Axle Spring (One)—R & R	2.1	2.1
13-11	Steering Gear—Overhaul	.9	.9
13-12	Steering Gear—R & R	.7	.7
13-13	Steering Wheel—R & R	.2	.2
13-14	Valve, Relief—R & R	.....	.5
13-15	Valve Assembly, Control, R & R	.....	.6
16-1	Drive Wheels—Retire	.8	1.4
16-2	Front Wheels—Retire	.7	.7
18-1	Floor Board—R & R	.2	.2
18-2	Fuel Tank Cover—R & R	.3	.....
18-3	Hydraulic Tank and Seat Frame—R & R	2.0	2.0
18-4	Safety Rack—R & R	.5	.5
18-5	Seat Spring—R & R	.2	.....
18-6	Side Panels—R & R	.4	.....
37-1	Battery—R & R	.1	.1
37-2	Battery Ground Cable—R & R	.1	.1
63-1	Hydraulic Oil Tank—R & R	1.0	1.0
63-2	Hydraulic Pump and Gasket—R & R	.9	.9
63-3	Lift Cylinder—Overhaul	2.6	2.6
63-4	Lift Cylinder to Tank Line—R & R	.5	.5
63-5	Mast and Lift Cylinder—Overhaul	7.0	7.0
63-6	Pump to Valve Hydraulic Line—R & R	.4	.4
63-7	Tank to Pump Hydraulic Line—R & R	.7	.7
63-8	Tilt Cylinder—Overhaul (in unit)	.8	.8
63-9	Tilt Cylinder—Overhaul (out of unit)	.5	.5
63-10	Tilt Cylinder Crossover Line (Front)—R & R	.4	.4
63-11	Tilt Cylinder Crossover Line (Rear)—R & R	.4	.4
63-12	Tilt Cylinder Gland—Repack (in unit)	.6	.6
63-13	Valve—R & R	.7	.7
63-14	Valve to Lift Cylinder Line—R & R	.3	.3
63-15	Valve to Tank Hydraulic Line—R & R	.5	.5
63-16	Valve to Tilt Cylinder (Front) Line—R & R	.4	.4
63-17	Valve to Tilt Cylinder (Rear) Line—R & W	.4	.4

Section 10—Equipment Maintenance Code 1360

TRUCK, LIFT, FORK, ELECTRIC, SRT (ALL CAPACITIES)

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls and Linkage
16—Tires
18—Hood—Fenders—Body
37—Battery
50—Motors—Electric
52—Controls—Electric
63—Hydraulic System

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11–1	Differential—Overhaul (out of unit) (two men)	2.5
11–2	Differential—R & R (two men)	6.0
11–3	Drive Axle—R & R	.6
11–4	Drive Wheels—R & R	.4
11–5	Drive Wheel Bearings—Remove, Repack and Replace	.6

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Brake Pedal Spring—R & R	.3
12–2	Brake Shoes—Reline—Bonded	.2
12–3	Adjust Brakes—Minor	.5
12–4	Adjust Brakes—Major	1.8
12–5	Adjust Brake Pedal	.2
12–6	Brake Shoes—R & R	1.8
12–7	Brake Cylinder—R & R	1.7
12–8	Brake Cylinder—Overhaul	.5
12–9	Drive Motor Brake—Adjust	.3
12–10	Drive Motor Brake—R & R	.7
12–11	Drive Motor Brake Shoes—Reline	.2
12–12	Drive Motor Brake Springs—R & R	.4
12–13	Lift Motor Brake—Adjust	.2
12–14	Lift Motor Brake—R & R	.5
12–15	Lift Motor Brake Shoes—Reline	.1
12–16	Lift Motor Brake Springs—R & R	.4
12–17	Master Cylinder—R & R	1.0
12–18	Master Cylinder—Overhaul	.7
12–19	Hand Brake—Adjust	.6
12–20	Hand Brake—Reline	.6
12–21	Brake Lines—Bleed	.8
12–22	Brake Lines—R & R	1.0

Front Axle—Wheels—Controls and Linkage—Repair Code 13

Operation	Description	Time All Models
13–1	Drag Link—Remove, Renew Ends, and Replace	1.0
13–2	Steer Axle Assembly—Overhaul (out-of-unit)	1.7
13–3	Steer Axle Assembly—R & R	1.0
13–4	Steer Gear Box—Overhaul (out-of-unit)	1.2
13–5	Steer Gear Box—R & R	.6
13–6	Steering—Inspect and Service	.3
13–7	Steering Wheel—R & R	.2
13–8	Tie Rod—Remove, Renew Ends, and Replace	1.0
13–9	Wheel Bearings—Remove, Repack and Replace	.9
13–10	Wheels—R & R	.5

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tires—Drive Wheels—R & R	.8
16–2	Tires—Steer Wheels—R & R	1.0

Hood—Finders—Body—Repair Code 18

Operation	Description	Time All Models
18–1	Lift Chains—R & R	1.0
18–2	Lift Forks—R & R	.2
18–3	Mast—Remove, Rebuild, and Replace	8.0
18–4	Step Pedal Return Spring—R & R	.2

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R	.2
37–2	Battery Plug—R & R	.5
37–3	Charging Plug—R & R	.5

Motors—Electric—Repair Code 50

Operation	Description	Time All Models
50–1	Drive Motor—Clean and Inspect	.5
50–2	Drive Motor—Overhaul	15.0
50–3	Drive Motor—R & R	1.6
50–4	Drive Motor Wires—R & R	.3
50–5	Lift Motor—Clean and Inspect	.5
50–6	Lift Motor—Overhaul	11.0
50–7	Lift Motor—R & R	1.6
50–8	Lift Motor Wires—R & R	.4
50–9	Tilt Motor—Clean and Inspect	.4
50–10	Tilt Motor—R & R	.7
50–11	Tilt Motor Wires—R & R	.4

Controls—Electric—Repair Code 52

Operation	Description	Time All Models
52–1	Contacts—One Set—R & R	.3
52–2	Drive and Hoist Contacts (Clean and Service)	2.0
52–3	Drive, Lift or Tilt Controller—Repair	2.5
52–4	Drive Motor Controllers—Clean and Inspect	.6
52–5	Lift Motor Controllers—Clean and Inspect	.5
52–6	Tilt Motor Controller—Clean and Inspect	.5
52–7	Hour Meter—R & R	.3
52–8	Horn—R & R	.3
52–9	Horn Button—R & R	.3
52–10	Battery—Flush	.3
52–11	Battery Cable and Lug Resolder	.5
52–12	Resistor—R & R	.5
52–13	Resistor—Overhaul	2.0
52–14	Directional Control Switch—R & R	.5
52–15	Directional Control Switch—Overhaul	1.0
52–16	Limit Switch (Brake)—R & R	1.5
52–17	Limit Switch (Brake)—Overhaul	.5

TIME STANDARDS—Continued

Hydraulic System—Repair Code 63

Operation	Description	Time All Models
63–1	Hydraulic Oil Tank—R & R	1.5
63–2	Hydraulic Pump and Gasket—R & R	2.0
63–3	Hydraulic Pump—Overhaul	2.0
63–4	Lift Cylinder—Overhaul	2.4
63–5	Lift Cylinder to Tank Line—R & R	.7
63–6	Pump to Valve Hydraulic Line—R & R	.6
63–7	Tank to Pump Hydraulic Line—R & R	1.3
63–8	Tilt Cylinder—Overhaul (out of unit)	1.6
63–9	Tilt Cylinder—R & R	1.5

Hydraulic System—Repair Code 63—Continued

Operation	Description	Time All Models
63–10	Tilt Cylinder Crossover Line (Front)—R & R	.8
63–11	Tilt Cylinder Crossover Line (Rear)—R & R	1.1
63–12	Valve—R & R	1.5
63–13	Valve to Life Cylinder Line—R & R	.7
63–14	Valve to Tank Hydraulic Line—R & R	.8
63–15	Valve to Tilt Cylinder (Front) Line—R & R	.8
63–16	Valve to Tilt Cylinder (Rear) Line—R & R	.8
63–17	Valve—Overhaul	2.0

Section 11—Equipment Maintenance Code 1370

TRUCK, LIFT, FORK, ELECTRIC, SRT, SPARK ENCLOSED (ALL CAPACITIES)

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Springs—Controls and Linkage
16—Tires
18—Hood—Fenders—Body
37—Battery
50—Motors
52—Controls
63—Hydraulic System

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Model
11–1	Differential—Overhaul (out-of-unit)	2.7
11–2	Differential—R & R	4.0
11–3	Drive Axle—R & R	.8
11–4	Drive Wheels—R & R	.9
11–5	Wheel Bearings—R & R Service	.8

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Adjustment—Major	1.1
12–2	Adjustment—Minor	.3
12–3	Brake Cylinder—Overhaul (out-of-unit) (Per Cylinder)	.3
12–4	Brake Cylinder—R & R	1.3
12–5	Brake Line—Central—R & R	.2
12–6	Brake Line—R & R	1.0
12–7	Brake Lines—Bleed	.8
12–8	Brake Pedal—Adjust	.2
12–9	Brake Shoes—R & R	1.2
12–10	Brake Shoes—Reline—Bonded	.2
12–11	Brake Shoes—Reline (Per Wheel)	.3
12–12	Drive Motor Brake Spring—R & R	.4
12–13	Drive Motor Brake—Adjust	.4
12–14	Drive Motor Brake—R & R	1.1
12–15	Master Cylinder—Overhaul (out-of-unit)	.4
12–16	Master Cylinder—R & R	.4
12–17	Hand Brake—Adjust	.6
12–18	Hand Brake—Reline	.6

Front Axle—Wheels—Springs—Controls and Linkage—Repair Code 13

Operation	Description	Time All Models
13–1	Connecting Link—R & R	.6
13–2	Drag Link or Chain—R & R	.5
13–3	Reversing Return Spring—R & R	.5
13–4	Speed Return Spring—R & R	.5
13–5	Star Wheel Springs—R & R	.1
13–6	Steer Axle Assembly—Overhaul (out-of-unit)	1.7
13–7	Steer Axle Assembly—R & R	1.1
13–8	Steering—Inspect and Service	.3
13–9	Steering Gear—Overhaul (out-of-unit)	1.1
13–10	Steering Gear—R & R	.5
13–11	Steering Wheel—R & R	.2
13–12	Wheel Bearings—Remove, Repack, and Replace	.9
13–13	Wheels—R & R	.6

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tires—Drive Wheels—Solid—R & R	1.2
16–2	Tires—Steer Wheels—Solid—R & R	1.2

Hood—Fenders—Body—Repair Code 18

Operation	Description	Time All Models
18–1	Lift Chains—R & R	1.1
18–2	Lift Forks—R & R	.2
18–3	Mast—Overhaul (out-of-unit)	3.8
18–4	Mast—R & R	2.2

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R	.4
37–2	Battery Plug—R & R	.5
37–3	Charging Plug—R & R	.5

Motors—Repair Code 50

Operation	Description	Time All Models
50–1	Drive Motor—Clean and Inspect	.6
50–2	Drive Motor—R & R	4.0
50–3	Drive Motor—Overhaul	16.0
50–4	Drive Motor Wires—R & R	.4
50–5	Tilt and Lift Motor—Clean and Inspect	.5
50–6	Tilt and Lift Motor—R & R	2.2
50–7	Tilt and Lift Motor—Overhaul	12.0
50–8	Tilt and Lift Motor Wires—R & R	.3

Controls—Repair Code 52

Operation	Description	Time All Models
52–1	Contact Release Springs—R & R	.5
52–2	Contacts—One Set—R & R	.3
52–3	Drive and Hoist Contacts—Clean and ce.	2.5
52–4	Controller Contact Springs—R & R	.1
52–5	Controller Finger and Roller—R & R	4.0
52–6	Drive, Lift or Tilt Controller—Repair	2.0
52–7	Drive Motor Controller—Clean and Inspect	.6
52–8	Drive Motor Controller—R & R	.7
52–9	Reversing Drum Contacts—R & R	.5
52–10	Tilt and Lift Motor Controller—Clean and Inspect	.6
52–11	Hour Meter—R & R	.3
52–12	Horn—R & R	.3
52–13	Horn Button—R & R	.3
52–14	Battery Flush	.3
52–15	Battery Cable Lug Resolder	.5
52–16	Resistor—R & R	1.5
52–17	Resistor—Overhaul	2.0
52–18	Directional Control Switch—R & R	.5
52–19	Directional Control Switch—Overhaul	1.0
52–20	Limit Switch (Brake)—R & R	1.5
52–21	Limit Switch—Overhaul	.5

Hydraulic System—Repair Code 63

Operation	Description	Time All Models
63–1	Hydraulic Oil Tank—R & R	1.1
63–2	Hydraulic Pump and/or Gasket—R & R	1.0

TIME STANDARDS—Continued

Hydraulic System—Repair Code 63—Continued

Operation	Description	Time All Models
63–3	Hydraulic Pump—Overhaul	2.0
63–4	Lift Cylinder—Overhaul	2.3
63–5	Lift Cylinder to Tank Line—R & R	.6
63–6	Mast and Lift Cylinder—Overhaul	6.6
63–7	Pump to Valve Hydraulic Line—R & R	.5
63–8	Tank to Pump Hydraulic Line—R & R	.8
63–9	Tilt Cylinder—Overhaul (in-unit)	1.1
63–10	Tilt Cylinder—Overhaul (out-of-unit)	.7
63–11	Tilt Cylinder—R & R	2.0

Hydraulic System—Repair Code 63—Continued

Operation	Description	Time All Models
63–12	Tilt Cylinder Crossover Line (Front)—R & R	.4
63–13	Tilt Cylinder Crossover Line (Rear)—R & R	.5
63–14	Tilt Cylinder Gland—Repack (in-unit)	.4
63–15	Valve—R & R	.7
63–16	Valve to Lift Cylinder Line—R & R	.3
63–17	Valve to Tank Hydraulic Line—R & R	.5
63–18	Valve to Tilt Cylinder (Front) Line—R & R	.4
63–19	Valve to Tilt Cylinder (Rear) Line—R & R	.4
63–20	Valve—Overhaul	2.0

TRUCK, LIFT, FORK, ELECTRIC, PRT, EXPLOSION PROOF, ALL CAPACITIES

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Hubs—Springs—Controls and Linkage
16—Tires
18—Hood—Fenders—Body
37—Battery
50—Motors
52—Controls

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11–1	Differential—Overhaul (out-of-unit)	2.0
11–2	Differential—R & R	7.5
11–3	Drive Axle—R & R	.6
11–4	Drive Wheel Bearings—Remove, Repack and Replace	.5
11–5	Drive Wheels—R & R	.3

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Brake Pedal Spring—R & R	.2
12–2	Brake Shoes—Reline—Bonded	.2
12–3	Drive Motor Brake—Adjust	.4
12–4	Drive Motor Brake—R & R	1.0
12–5	Drive Motor Brake Shoes—Reline	.1
12–6	Drive Motor Brake Springs—R & R	.4
12–7	Lift Motor Brake—Adjust	.3
12–8	Lift Motor Brake—R & R	.9
12–9	Lift Motor Brake Shoes—Reline	.1
12–10	Lift Motor Brake Springs—R & R	.4

Front Axle—Wheels—Hubs—Springs—Controls and Linkage—Repair Code 13

Operation	Description	Time All Models
13–1	Drag Link—R & R	1.0
13–2	Steer Axle Assembly—Overhaul (out-of-unit)	1.5
13–3	Steer Axle Assembly—R & R	1.0
13–4	Steer Gear Box—Overhaul (out-of-unit)	1.1
13–5	Steer Gear Box—R & R	.3
13–6	Steering—Inspect and Service	.3
13–7	Steering Wheel—R & R	.2
13–8	Tie Rod—R & R	1.0
13–9	Wheel Bearings—Remove, Repack and Replace	.9
13–10	Wheels—R & R	.5

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tires—Drive Wheels—R & R	.8
16–2	Tires—Steer Wheels—R & R	.8

Hood—Fenders—Body—Repair Code 18

Operation	Description	Time All Models
18–1	Directional Control Box Cover—R & R	.1
18–2	Drive Motor Cover—R & R	.2
18–3	Junction Box Cover—R & R	.4
18–4	Lift Chains—R & R	1.0
18–5	Lift Forks—R & R	.2
18–6	Mast—Remove, Rebuild, and Replace	8.0
18–7	Step Pedal Return Spring—R & R	.2
18–8	Tilt or Lift Control Box Cover—R & R	.1
18–9	Tilt or Lift Motor Cover—R & R	.1

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R (Check all Grounds)	.3
37–2	Battery Plug—R & R	.4
37–3	Charging Plug—R & R	.4

Motors—Repair Code 50

Operation	Description	Time All Models
50–1	Drive Motor—Clean and Inspect	.6
50–2	Drive Motor—R & R	2.1
50–3	Drive Motor Wires—R & R	.2
50–4	Lift Motor—Clean and Inspect	.7
50–5	Lift Motor—R & R	6.5
50–6	Lift Motor Wires—R & R	.3
50–7	Tilt Motor—Clean and Inspect	.5
50–8	Tilt Motor—R & R	2.0
50–9	Tilt Motor Wires—R & R	.3

Controls—Repair Code 52

Operation	Description	Time All Models
52–1	Contacts—One Set—R & R	.2
	Add for each additional set replaced	(.1)
52–2	Drive, Lift or Tilt Controller—Repair	Est.
52–3	Drive Motor Controllers—Clean and Inspect	.8
52–4	Lift Motor Controllers—Clean and Inspect	.6
52–5	Tilt Motor Controller—Clean and Inspect	.6
52–6	Hour Meter—R & R	.3
52–7	Horn—R & R	.3
52–8	Horn Button—R & R	.3
52–9	Battery—Flash	.3
52–10	Battery Cable Lug Resolder	.5

Section 13—Equipment Maintenance Code 1390

TRUCK, LIFT, FORK, TIERING, STRADDLE AND REACH TYPE, ELECTRIC

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
13—Front Axle, Wheels, Springs, Controls
16—Tires
18—Body, Fenders
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM CODE 1390

		Time
A	Obtain Scaffold—Position—Remove	.2
B	Jack Up Wheels	.2
C	Wheel Guards, R or L—R & R	.2
D	Block Up Unit, Front or Rear	.2

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11–1	Differential—Overhaul	3.5
11–2	Differential—R & R	2.2
11–3	Drive Wheel Sprockets—R & R (Per Sprocket)	.8
11–4	Drive Wheels—R & R (Per Wheel)	.9
11–5	Fork Tubes, Bearings, Sleeves and Springs—R & R (Per Side)	3.3
11–6	Wheel Bearings and Oil Seals—Repack and Service (Per Wheel)	1.0

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Brake Lines—Bleed	.2
12–2	Brake Master Cylinder—Overhaul	.4
12–3	Brake Master Cylinder—R & R	.5
12–4	Brake Pedal—Adjust	.1
12–5	Brake Shoes—R & R (Both Front or Both Rear)	.7
12–6	Brake Shoes, Bonded—Reline	.2
12–7	Brake Wheel Cylinder—Overhaul (One)	.3
12–8	Brake Wheel Cylinders—R & R (Both Front or Both Rear)	.8
12–9	Brakes—Major Adjustment	.7
12–10	Brakes—Minor Adjustment	.5
12–11	Hoist Brake—Adjust	.2
12–12	Hoist Brake Lining—R & R	.2

Front Axle, Wheels, Springs, Controls—Repair Code 13

Operation	Description	Time All Models
13–1	Front Fork Tubes—Bearings, Sleeves, and Springs—R & R (Per Side)	3.1
13–2	Front Wheels—R & R (Per Wheel)	.6
13–3	Steer Gear—Adjust	.2
13–4	Steer Gear and Wheel Assembly—Overhaul	2.0

Front Axle, Wheels, Springs, Controls—Repair Code 13—Continued

Operation	Description	Time All Models
13–5	Steer Gear and Wheel Assembly—R & R	1.7
13–6	Steering Arm—R & R (One)	.4
13–7	Tie Rods—R & R (Front or Rear)	.4
13–8	Wheel Bearings and Oil Seals—Repack and Service (Per Wheel)	.7

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tires, Drive Wheels—R & R	.9
16–2	Tires, Steer Wheels—R & R	1.0

Body, Fenders—Repair Code 18

Operation	Description	Time All Models
18–1	Drive Chain Guard—R & R	.2
18–2	Fork Tube Guard—R & R (One)	.2
18–3	Wheel Guards—R & R	.2

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R	.1
37–2	Battery Plug—R & R	.4
37–3	Charging Plug—R & R	.4

Hydraulic System—Repair Code 63

Operation	Description	Time All Models
63–1	Hydraulic Hoses—R & R	1.5
63–2	Hydraulic Tubing—R & R	.8
63–3	Vacuum Cylinder Valve—Overhaul	.7
63–4	Vacuum Cylinder Valve—R & R	1.0
63–5	Vacuum Power Cylinder—Overhaul	.6
63–6	Vacuum Power Cylinder—R & R	1.2
63–7	Vacuum Tank—R & R	1.0

TRUCK, FIXED PLATFORM, GAS, PRT (ALL MAKES)

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
18—Hood—Body
37—Battery

BASIC STANDARDS—EM Code 1400

		Time
A	Hood Assembly—R & R	.2
B	Block Up Rear or Front End	.2
C	Cab (Top)—R & R	2.8

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time All Models
01–1	Engine—Bore for Sleeves	13.5
01–2	Engine—Bore Oversize	7.6
01–3	Engine—Disassemble	2.4
01–4	Engine—Dynamometer Test	2.2
01–5	Engine—Head and Gasket—R & R	1.5
01–6	Engine—R & R	5.4
01–7	Engine—Reassemble	8.6
01–8	Engine—Tappets—Adjust	3.7
01–9	Engine—Tune Up	1.0
01–10	Engine—Tune Up—Minor	2.0
01–11	Engine—Tune Up—Major	2.5
01–12	Engine—Valve Springs—R & R	2.8
	(Include For Each Spring Renewed)	(.1)
01–13	Timing Case Cover and/or Gasket—R & R	4.5

Clutch—Repair Code 02

Operation	Description	Time All Models
02–1	Clutch—Adjust	.4
02–2	Clutch Facing—Reline	.3
02–3	Clutch—Pressure Plate—Facings or Release Bearing—R & R	2.9
02–4	Clutch—Pressure Plate—Overhaul	.7
02–5	Flywheel—R & R	3.1
02–6	Ring Gear—R & R	.1

Fuel System—Repair Code 03

Operation	Description	Time All Models
03–1	Accelerator and/or Choke Linkage—R & R	.5
03–2	Air Filter—R & R—Service	.4
03–3	Carburetor—Governor—Adjust	.4
03–4	Carburetor—Overhaul	.6
03–5	Carburetor—R & R	.6
03–6	Fuel Pump—Overhaul	.6
03–7	Fuel Pump—R & R	.6
03–8	Gas Filter—R & R—Service	.4
03–9	Gas Tank—R & R	.8

Exhaust System—Repair Code 04

Operation	Description	Time All Models
04–1	Exhaust Pipe and Gasket—R & R	.6
04–2	Intake and Exhaust Section Gasket—R & R	1.4
04–3	Manifold and Gasket—R & R	1.1
04–4	Muffler—R & R	.4

Cooling System—Repair Code 05

Operation	Description	Time All Models
05–1	Fan Belt—Adjust	.1
05–2	Fan Belt—R & R	.4
05–3	Fan Blade—R & R	.6
05–4	Head Water Outlet Gasket—R & R	.6
05–5	Radiator—R & R	1.3
05–6	Radiator By-Pass Hose—R & R	.5
05–7	Radiator Drain Cock—R & R	.1
05–8	Radiator Hose, Upper or Lower—R & R	.5
05–9	Thermostat—R & R	.5
05–10	Water Pump—Overhaul	.6
05–11	Water Pump—R & R	1.1
05–12	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time All Models
06–1	Coil—R & R	.5
06–2	Distributor—Overhaul	.6
06–3	Distributor—R & R	.5
06–4	Generator—Adjust	.5
06–5	Generator—R & R	.6
06–6	Generator Recondition—Generator Removed	2.0
06–7	Horn—R & R	.5
06–8	Horn Button—R & R	.3
06–9	Ignition Switch—R & R	.6
06–10	Light Switch—R & R	.6
06–11	Lights—R & R (One)	.1
06–12	Spark Plug Wires—R & R	.6
06–13	Spark Plug—R & R	.5
06–14	Starter Cable—R & R	.5
06–15	Starter Motor—R & R	.6
06–16	Starter Recondition—Starter Removed	1.5
06–17	Starter Switch—R & R	.4
06–18	Starter Switch Cable—R & R	.4
06–19	Voltage Regulator—Adjust	.4
06–20	Voltage Regulator—R & R	.5
06–21	Voltage Regulator Recondition—Removed	1.0
06–22	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time All Models
07–1	Transmission—Overhaul	4.0
07–2	Transmission—R & R	2.6
07–3	Transmission—Service and Inspect (out of unit)	1.5

TIME STANDARDS—Continued

Transmission—Repair Code 07—Con.

Operation	Description	Time All Model
07-4	Transmission Rear Seal—R & R	1.9
07-5	Transmission Cover and Shift Assembly—Recondition	1.7
07-6	Automatic Transmission—R & R	3.4
07-7	Automatic Transmission Oil Pump—R & R (Add Automatic Transmission R & R for Front Pump)	1.8
07-8	Automatic Transmission Housing Oil Seal—R & R	1.0
07-9	Automatic Transmission Regulator Valve Body—R & R	3.4
07-10	Automatic Transmission Governor Assembly—Recondition	1.8

Drive Shaft and Universal—Repair Code 09

Operation	Description	Time All Models
09-1	Universal Joint, Propeller Shaft—Overhaul	.3
09-2	Universal Joint, Propeller Shaft—R & R	.5

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11-1	Differential—Overhaul	2.8
11-2	Differential—Ring and Pinion Gear (out of unit) R & R	1.1
11-3	Differential Assembly—R & R	2.1
11-4	Differential Seal—R & R	2.0
11-5	Drive Axle—Inspect, Service, Overhaul (out of unit)	.4
11-6	Drive Axle—R & R	1.6
11-7	Drive Wheels—Bearings and Grease Seals (Both Wheels)	.2
11-8	Drive Wheels—R & R (Both Wheels)	.7

Brakes—Repair Code 12

Operation	Description	Time All Models
12-1	Brakes—Major Adjustment	1.0
12-2	Brakes—Minor Adjustment	.5
12-3	Brake Cylinder—Overhaul	.3
12-4	Brake Cylinder—R & R	1.0
12-5	Brake Drum—R & R	1.6
12-6	Brake Line—R & R	.3
12-7	Brake Lines—Bleed	.2
12-8	Brake Pedal—Adjust	.1
12-9	Brake Shoes—R & R	1.2

Brakes—Repair Code 12—Continued

Operation	Description	Time All Models
12-10	Brake Shoes—Reline (Per Set)	.2
12-11	Brake Shoes, Bonded—Reline (Per Set)	.1
12-12	Hand Brake—Adjust	.2
12-13	Master Cylinder—Overhaul	.4
12-14	Master Cylinder—R & R	.5

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time All Models
13-1	Drive Axle Assembly—Overhaul	3.0
13-2	Steer Axle Assembly—Overhaul	2.5
13-3	Steer Axle Assembly—R & R	2.0
13-4	Steering Gear—R & R	1.9
13-5	Steer Wheels—R & R	.5
13-6	Steering—Inspect and Service	.5
13-7	Steering Wheel—R & R	.2
13-8	Tie Rod—R & R	.5
13-9	Wheel Bearings—Remove, Repack, and Replace	.7

Power Steering

Operation	Description	Time All Models
13-10	Cylinder, Steering, Air Booster—R & R	.9
13-11	Valve Assembly, Control—R & R	.5
13-12	Valve, Relief—R & R	.4
13-13	Pump, Hydraulic—R & R	.5
13-14	Flexible Oil Line—R & R	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time All Models
16-1	Tire, Drive Wheel, Inner—R & R	1.1
16-2	Tire, Drive Wheel, Outer—R & R	.8
16-3	Tire, Steer Wheel—R & R	.8

Hood—Body—Repair Code 18

Operation	Description	Time All Models
18-1	Engine Hood Assembly—R & R	.6
18-2	Hood Side Panel (R or L)—R & R	.1

Battery—Repair Code 37

Operation	Description	Time All Models
37-1	Battery—R & R	.3
37-2	Battery Plug—R & R	.4

Section 15—Equipment Maintenance Code 1410

TRUCK, FIXED PLATFORM, ELECTRIC, PRT (ALL MAKES)

REPAIR CODES

09—Drive Shaft and Universal Joints
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
37—Battery

TIME STANDARDS

Drive Shaft and Universal Joints—Repair Code 09

Operation	Description	Time All Models
09–1	Drive Shaft—R & R (Per Wheel)	.3
09–2	Universal Joint—R & R (Per Wheel)	.3

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11–1	Differential Assembly—Inspect and Service (out of unit)	.5
11–2	Differential Assembly—Overhaul	3.6
11–3	Differential Assembly—R & R	3.1
11–4	Power Axle—R & R	2.3
11–5	Wheels, Drive—R & R (Two Wheels)	.4
11–6	Wheel Bearings—Repack, Service (Two Wheels)	.6

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Brake Linkage—R & R	.5
12–2	Brake Linkage—Tighten and Adjust	.3
12–3	Brake Pedal—R & R	.4
12–5	Brake Shoes—Reline (Per Set)	.1

Brakes—Repair Code 12—Continued

Operation	Description	Time All Models
12–6	Brake Shoes, Bonded—Reline (Per Set)	.2
12–7	Brakes—Adjust	.2

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time All Models
13–1	Axle Springs—R & R	.8
13–2	Bell-Crank Bearings—R & R	.4
13–3	Steer Knuckles and Yoke—R & R	.6
13–4	Tie Rods—R & R (One)	.4
13–5	Wheel Bearings—Repack, Service (Two Wheels)	.6
13–6	Wheels, Steer—R & R (Two Wheels)	.4

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tires, Drive Wheels—R & R	1.0
16–2	Tires, Steer Wheels—R & R	1.0

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R	.3
37–2	Battery Plug—R & R	.4
37–3	Charging Plug—R & R	.4

TRUCK, ELEVATING PLATFORM, ELECTRIC, SRT

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls—Linkage Springs
16—Tires
18—Body—Guards and Hoods
37—Battery
50—Motor
52—Controls
63—Hydraulic System

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11–1	Differential—Overhaul (out-of-unit)	3.4
11–2	Differential—R & R	3.1
11–3	Drive Axles—R & R	.5
11–4	Drive Axle Springs—R & R	3.5
11–5	Drive Wheel Bearings—Remove, Repack and Replace	.6
11–6	Drive Wheels—R & R	.4
11–7	Drive Wheel Universal Forks—R & R	.6

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Brake Pedal Spring—R & R	.4
12–2	Brake Shoes—Reline—Bonded	.2
12–3	Drive Motor Brake—Adjust	.3
12–4	Drive Motor Brake Shoes—R & R	.6
12–5	Drive Motor Brake Shoes—Reline (out-of-unit)	.2
12–6	Drive Motor Brake Spring—R & R	.3
12–7	Lift Motor Brake—Adjust	.3
12–8	Lift Motor Brake Shoes—R & R	.8
12–9	Lift Motor Brake Shoes—Reline (out-of-unit)	.2
12–10	Lift Motor Brake Spring—R & R	.3

Front Axle—Wheels—Controls—Linkage Springs—Repair Code 13

Operation	Description	Time All Models
13–1	Drive Axle Assembly—Overhaul	3.0
13–2	Steer Axle Assembly—Overhaul	2.5
13–3	Steer Gear Box—Remove, Overhaul and Replace	1.4
13–4	Steer Wheels—R & R	.5
13–5	Steering—Inspect and Service	.5
13–6	Steering Wheel or Arm—R & R	.2
13–7	Tie Rod—R & R	.5
13–8	Wheel Bearings—Remove, Repack and Replace	.8

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tires—Drive Wheels—R & R	.9
16–2	Tires—Steer Wheels—R & R	1.0

Body—Guards and Hoods—Repair Code 18

Operation	Description	Time All Models
18–1	Hoisting Unit—Remove, Overhaul and Replace	3.7
18–2	Lifting Platform—R & R	.8
18–3	Step Pedal Return Spring—R & R	.4

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R	.2
37–2	Battery Plug—R & R	.4
37–3	Charging Plug—R & R	.4

Motor—Repair Code 50

Operation	Description	Time All Models
50–1	Drive Motor—Clean and Inspect	.5
50–2	Drive Motor—R & R	2.5
50–3	Lift Motor—Clean and Inspect	.5
50–4	Lift Motor—R & R	2.2
50–5	Pump Motor—Clean and Inspect	.4
50–6	Pump Motor—R & R	.8

Controls—Repair Code 52

Operation	Description	Time All Models
52–1	Controller—Remove, Repair and Replace	Est.
52–2	Controller Contact Spring—R & R	.3
52–3	Controller Contacts—One Set—R & R	.5
	Add for each additional set replaced	(.1)
52–4	Controller Return Spring—R & R	.5
52–5	Drive Motor Controller—Clean and Inspect	.5
52–6	Lift Motor Controller—Clean and Inspect	.5
52–7	Horn—R & R	.3
52–8	Horn Button—R & R	.3
52–9	Hour Meter—R & R	.3
52–10	Battery Flush	.3
52–11	Battery Cable Lug Resolder	.5

Hydraulic System—Repair Code 63

Operation	Description	Time All Models
63–1	Hydraulic Cylinder—Remove, Repair and Replace	1.5
63–2	Hydraulic Line—R & R	.5
63–3	Hydraulic Pump—Remove, Repair and Replace	1.5
63–4	Hydraulic Tank—R & R	1.7

TRUCK, ELEVATING PLATFORM, GAS, PRT

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
18—Body
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Code 1430

		Time
A	Hood Assembly—R & R	.2
B	Block Up Front or Rear End	.2
C	Hoisting Unit—R & R	.7

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01–1	Engine—Bore for Sleeves	13.2
01–2	Engine—Bore Oversize	7.2
01–3	Engine—Disassemble	2.3
01–4	Engine—Dynamometer Test	2.2
01–5	Engine—R & R	7.8
01–6	Engine—Reassemble	8.5
01–7	Engine—Tune-Up	.8
01–8	Engine Head and Gasket—R & R	1.1
01–9	Engine Mount Springs—R & R	.4
01–10	Engine Tappets—Adjust	2.8
01–11	Engine Timing Gear Cover and Gasket—R & R.	8.2
01–12	Engine Valve Spring—R & R	2.5
01–13	Oil Gage—R & R	.3

Clutch—Repair Code 02

Operation	Description	Time
02–1	Clutch—Adjust	.2
02–2	Clutch Facing—Reline	.3
02–3	Clutch Pedal Springs—R & R	.3
02–4	Flywheel—R & R	4.6
02–5	Flywheel Ring Gear—Install	.1
02–6	Pressure Plate—Overhaul	.6
02–7	Pressure Plate Facing and Release Bearing—R & R	3.5

Fuel System—Repair Code 03

Operation	Description	Time
03–1	Accelerator Spring—R & R	.1
03–2	Air Filter—Clean	.1
03–3	Carburetor—Overhaul	.5
03–4	Carburetor—R & R	.3
03–5	Carburetor and Governor—Adjust	.2
03–6	Carburetor Return Spring—R & R	.1
03–7	Fuel Filter—Clean	.1
03–8	Fuel Gage—R & R	.3
03–9	Fuel Pump—Overhaul	.3
03–10	Fuel Pump—R & R	.4
03–11	Fuel Tank—R & R	.6

Exhaust System—Repair Code 04

Operation	Description	Time
04–1	Exhaust Pipe and Gasket—R & R	.7
04–2	Heat Control Thermostat	.1
04–3	Intake and Exhaust Section Gasket—R & R	1.0
04–4	Manifold and Gasket—R & R	1.7
04–5	Muffler—R & R	.6
04–6	Muffler, Exhaust Pipe and Gaskets—R & R	.9

Cooling System—Repair Code 05

Operation	Description	Time
05–1	Engine Drain Cock—R & R	.1
05–2	Fan Belt—R & R	.1
05–3	Fan Blade—R & R	.2
05–4	Heat Water Outlet Gasket—R & R	.3
05–5	Radiator—R & R	1.2
05–6	Radiator Drain Cock—R & R	.1
05–7	Radiator Hose—R & R	.2
05–8	Water Pump—Overhaul	.5
05–9	Water Pump—R & R	1.4
05–10	Temperature Gage—R & R	.3
05–11	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time
06–1	Ammeter—R & R	.3
06–2	Coil—R & R	.2
06–3	Distributor—Overhaul	.5
06–4	Distributor—R & R	.2
06–5	Generator—Adjust	.2
06–6	Generator—R & R	.3
06–7	Horn—R & R or Adjust	.2
06–8	Horn Button—R & R	.3
06–9	Ignition Switch—R & R	.3
06–10	Spark Plugs—R & R	.3
06–11	Spark Plug Wires—R & R	.3
06–12	Starter—R & R	.4
06–13	Starter Cable—R & R	.2
06–14	Starter Switch—R & R	.5
06–15	Voltage Regulator—Adjust	.3
06–16	Voltage Regulator—R & R	.4
06–17	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time
07–1	Ring and Pinion Gear Assembly—Overhaul	1.0
07–2	Transmission—Overhaul	3.2
07–3	Transmission—R & R	3.0
07–4	Transmission—Replace Grease Seals and Inspect	1.3

Automatic Transmission

Operation	Description	Time
07–5	Automatic Transmission—R & R	3.4
07–6	Automatic Transmission Oil Pump R & R (Add Automatic Transmission R & R for Front Pump)	1.8

TIME STANDARDS—Continued

Automatic Transmission—Continued

Operation	Description	Time
07–7	Automatic Transmission Housing Oil Seal—R & R	1.0
07–8	Automatic Transmission Regulator Valve Body—R & R	3.4
07–9	Automatic Transmission Governor Assembly—Recondition	1.8

Drive Shaft and Universal—Repair Code 09

Operation	Description	Time
09–1	Universal Joint—R & R	.5
09–2	Universal Joint—Replace Bearings	1.0

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11–1	Differential Assembly—Overhaul	2.3
11–2	Differential Assembly—R & R	3.0
11–3	Rear Axle—R & R	1.8
11–4	Wheels, Drive—R & R	.8

Brakes—Repair Code 12

Operation	Description	Time
12–1	Brake Adjustment, Major	.8
12–2	Brake Adjustment, Minor	.3
12–3	Brake Cylinder—Overhaul (out of unit)	.3
12–4	Brake Cylinder—R & R	1.3
12–5	Brake Line, Central—R & R	.2
12–6	Brake Line, L or R—R & R	.3
12–7	Brake Lines—Bleed	.2
12–8	Brake Pedal—Adjust	.2
12–9	Brake Shoes, Bonded—Reline	.2
12–10	Brake Shoes—R & R	1.4
12–11	Brake Shoes—Reline (Per Wheel)	.2
12–12	Hand Brake—Adjust	.3
12–13	Hand Brake Band—Reline	.1
12–14	Master Cylinder—Overhaul (out of unit)	.3
12–15	Master Cylinder—R & R	.3

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13–1	Steer Wheels—Repack	.5
13–2	Steering—Inspect	.3
13–3	Steering Assembly—Overhaul	1.9
13–4	Steering Assembly—R & R	1.7
13–5	Steering Axle Drag Link—R & R	.6
13–6	Steering Gear—Overhaul	.9
13–7	Steering Gear—R & R	.7
13–8	Steering Wheel—R & R	.3

Power Steering

Operation	Description	Time
13–9	Cylinder, Steering, Air Booster—R & R	.8
13–10	Valve, Relief—R & R	.3
13–11	Valve Assembly, Control—R & R	.5
13–12	Pump, Hydraulic—R & R	.5
13–13	Flexible Oil Line—R & R	.2
13–14	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.3

Tires—Repair Code 16

Operation	Description	Time
16–1	Drive Wheels—Retire	.9
16–2	Steer Wheels—Retire	.8

Body—Repair Code 18

Operation	Description	Time
18–1	Hoisting Unit—Remove, Overhaul, Replace	3.7
18–2	Lifting Platform—R & R	.4

Battery—Repair Code 37

Operation	Description	Time
37–1	Battery—R & R	.1
37–2	Battery Ground Cable—R & R	.1

Hydraulic System—Repair Code 63

Operation	Description	Time
63–1	Hydraulic Cylinder—Remove, Repair, Replace	1.5
63–2	Hydraulic Line—R & R	.5
63–3	Hydraulic Pump—Remove, Repair, Replace	1.5
63–4	Hydraulic Tank—R & R	1.7

Section 18—Equipment Maintenance Code 1500

TRUCK, STRADDLE-CARRY, GAS, PRT (UP TO 30,000#)

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Springs—Controls and Linkage
16—Tires
18—Hood—Fenders—Body
37—Battery
63—Hydraulic System
85—Hoist—Winch Assemblies

BASIC STANDARDS—EM Code 1500

		Time
A	Obtain Scaffold—Position—Remove	.2
B	Jack Up Wheels	.2
C	Hood and Side Panels—R & R	.1
D	Wheel Guards, Rear—R & R (R or L)	.2
E	Drive Chain Guard (R or L)—R & R	.2
F	Fork Tube Guards—R & R—Front R or L	.2
	Rear R or L	.2
G	Block Up Unit—Front or Rear	.2

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time All Models
01–1	Engine—Bore for Sleeves	14.0
01–2	Engine—Bore for Oversize	7.8
01–3	Engine—Disassemble	2.7
01–4	Dynamometer Test	2.2
	NOTE: In this standard, *full attention is not required for the 3¼ hours run-in time*—the standard includes .6 hour for attention and check of operating results.	
01–5	Engine—Head and/or Gasket—R & R	1.4
01–6	Engine—R & R	5.1
01–7	Engine—Reassemble	9.0
01–8	Engine—Tappets—Adjust	3.7
01–9	Engine—Tune Up	1.1
01–10	Engine—Tune Up—Minor	2.0
01–11	Engine—Tune Up—Major	2.5
01–12	Engine—Valve Springs—R & R	2.8
	Include for each spring renewed	(.1)

Clutch—Repair Code 02

Operation	Description	Time All Models
02–1	Clutch—Adjust	.4
02–2	Clutch Facing—Reline	.3
02–3	Clutch—Pressure Plate—Facings or Release Bearing—R & R	3.0
02–4	Clutch—Pressure Plate—Overhaul	.7
02–5	Flywheel—R & R	3.3
02–6	Ring Gear—On Flywheel—R & R	.1

Fuel System—Repair Code 03

Operation	Description	Time All Models
03–1	Accelerator and/or Choke Linkage—R & R	.5
03–2	Air Filter—R & R—Service	.4
03–3	Carburetor Governor—Adjust	.4
03–4	Carburetor—Overhaul	.6
03–5	Carburetor—R & R	.6
03–6	Fuel Pump—Overhaul	.6
03–7	Fuel Pump—R & R	.6
03–8	Gas Filter—R & R—Service	.4
03–9	Gas Tank—R & R	.9

Exhaust System—Repair Code 04

Operation	Description	Time All Models
04–1	Exhaust Pipe and/or Gasket—R & R	.7
04–2	Intake and Exhaust Section Gasket—R & R	1.4
04–3	Manifold and/or Gasket—R & R	1.2
04–4	Muffler—R & R	.5

Cooling System—Repair Code 05

Operation	Description	Time All Models
05–1	Fan Belt—Adjustment	.1
05–2	Fan Belt—R & R	.4
05–3	Fan Blade—R & R	.6
05–4	Head Water Outlet Gasket—R & R	.6
05–5	Radiator—R & R	1.6
05–6	Surge Tank—R & R	.8
05–7	Radiator By-Pass Hose	.5
05–8	Radiator Drain Cock—R & R	.1
05–9	Radiator Hose, Lower—R & R	.5
05–10	Radiator Hose, Upper—R & R	.5
05–11	Thermostat—R & R	.5
05–12	Water Pump—Overhaul	.7
05–13	Water Pump—R & R	.9
05–14	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time All Models
06–1	Ammeter—R & R	.4
06–2	Coil—R & R	.5
06–3	Dash Panel—Rewire	2.6
06–4	Distributor—Overhaul	.6
06–5	Distributor—R & R	.5
06–6	Generator—Adjustment	.5
06–7	Generator—Overhaul	2.0
06–8	Generator—R & R	.6
06–9	Horn—R & R	.5
06–10	Horn Button—R & R	.3
06–11	Ignition Switch—R & R	.6
06–12	Light Switch—R & R	.6
06–13	Lights (Tail, Head, Stop, Load, or Backup)—R & R	.1
06–14	Spark Plug Wires—R & R	.6
06–15	Spark Plugs—R & R	.5
06–16	Speedometer—R & R	.8
06–17	Starter Cable—R & R	.5
06–18	Hour Meter—R & R	.3
06–19	Starter Motor—R & R	.7
06–20	Starter Switch—R & R	.4
06–21	Starter Overhaul	1.5
06–22	Starter Switch Cable—R & R	.4
06–23	Voltage Regulator—Adjust	.4
06–24	Voltage Regulator—R & R	.5

TIME STANDARDS—Continued

Transmission—Repair Code 07

Operation	Description	Time All Models
07–1	Transmission—Overhaul	4.9
07–2	Transmission—R & R	3.3
07–3	Transmission—Service and Inspect (out-of-unit)	1.6

Automatic Transmission

Operation	Description	Time All Models
07–4	Automatic Transmission—R & R	3.7
07–5	Automatic Transmission Oil Pump—R & R (Add Automatic Transmission R & R for Front Pump)	1.9
07–6	Automatic Transmission Housing Oil Seal—R & R	1.0
07–7	Automatic Transmission Regulator Valve Body—R & R	3.4
07–8	Automatic Transmission Governor Assembly—Recondition	1.8

Drive Shaft and Universal—Repair Code 09

Operation	Description	Time All Models
09–1	Drive Axle, Jackshaft—Overhaul	1.0
09–2	Drive Axle, Jackshaft—R & R	.9
09–3	Drive Chain—Adjust—(Both Sides)	.3
09–4	Drive Chain—R & R	1.6
09–5	Drive Sprocket and Housing Assembly—Overhaul	.7
09–6	Drive Sprocket and Housing Assembly—R & R (Per Side)	1.9
09–7	P.T.O. Universal Joint—Overhaul	.4
09–8	P.T.O. Universal Joint—R & R	.6
09–9	Propeller Shaft—Overhaul	1.0
09–10	Propeller Shaft—R & R	.6
09–11	Universal Joints, Propeller—Overhaul	.4
09–12	Universal Joints, Propeller Shaft—R & R	.4

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11–1	Differential—Overhaul	3.9
11–2	Differential Axle Seals—R & R	2.5
11–3	Differential—R & R	2.6
11–4	Drive Wheel Sprockets—R & R (Per Sprocket)	.9
11–5	Drive Chains and Sprockets—R & R	14.0
11–6	Drive Wheels—R & R (Per Wheel)	.9
11–7	Fork Tubes, Bearings, Sleeves, and Springs—R & R (Per Side)	3.4
11–8	Wheel Bearings and Oil Seals—Repack and Service (Per Wheel)	1.0

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Brake Lines—Bleed	.3
12–2	Brake, Master Cylinder—Overhaul (Per Cylinder)	.5
12–3	Brake, Master Cylinder—R & R	.5
12–4	Brake Pedal—Adjust	.1
12–5	Brake Shoes—R & R (Both Front or Both Rear Wheels)	.7
12–6	Brake Shoes—Reline—Bonded	.3
12–7	Hand Brake Bank—Reline	.7
12–8	Brake Shoes—Reline (Per Wheel Set)	.3
12–9	Brake, Wheel-Cylinder—Overhaul (Per Cylinder)	.4
12–10	Brake, Wheel Cylinder—R & R (Both Front or Both Rear Wheels)	.8
12–11	Brakes—Major Adjustment (Both Front or Rear Wheels)	.8
12–12	Brakes—Minor Adjustment (Both Front or Rear Wheels)	.6
12–13	Differential and Jackshaft Brakes—Adjust	.1
12–14	Differential and Jackshaft Brakes, Band Assemblies—R & R	.3
12–15	Hoist Brake—Adjust	.3
12–16	Hoist Brake Lining—R & R	.4
12–17	Hoist Brake Drive Sprocket—R & R	4.0
12–18	Hydraulic Hose Assemblies—R & R (Front or Rear Connector)	.2
12–19	Tubing Assemblies—R & R	
	(a) Connector to Wheel	.2
	(b) Bracket to "T" Front or Rear	.2
	(c) Master Cylinder to "T" Right or Left	.2

Front Axle—Wheels—Springs—Controls and Linkage—Repair Code 13

Operation	Description	Time All Models
13–1	Bearing Auxiliary Shaft—R & R	.4
13–2	Drag Links—R & R	
	(a) Front Drag Link	.6
	(b) Center Drag Link	.6
	(c) Rear Drag Link	.6
13–3	Front Fork Tubes, Bearings, Sleeves and Springs—R & R (Per Side)	3.2
13–4	Front Wheels—R & R (Per Wheel)	.6
13–5	Wheels—Align	3.0
13–6	Steer Gear—Adjustments:	
	(a) Worm Bearing	.7
	(b) Roller Shaft	1.0
	(c) Thrust Bearings—"On Cam"	1.0
	(d) Tapered Stud—Backlash	.8
13–7	Steer Gear and Wheel Assembly—Overhaul	2.0
13–8	Steer Gear and Wheel Assembly—R & R	2.1
13–9	Steering Arms—R & R	
	Right—Front or Rear	.4
	Left—Front or Rear	.4
13–10	Tie Rods—R & R—Front or Rear	.5

TIME STANDARDS—Continued

Front Axle—Wheels—Springs—Controls and Linkage—Repair Code 13—Continued

Operation	Description	Time All Models
13–11	Wheel Bearings and Oil Seals—Repack and Service (Per Wheel)	.7

Power Steering

Operation	Description	Time All Models
13–12	Cylinder, Steering, Air Booster—R & R	.8
13–13	Valve, Relief—R & R	.3
13–14	Valve Assembly, Control—R & R	.5
13–15	Pump, Hydraulic—R & R	.5
13–16	Flexible Oil Line—R & R	.2
13–17	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tires, Drive Wheels, Pneumatic—R & R	1.1
16–2	Tires, Front Wheels, Pneumatic—R & R	1.1

Hood—Fenders—Body—Repair Code 18

Operation	Description	Time All Models
18–1	Drive Chain Guard—R & R	.2
18–2	Fork Tube Guards—Front or Rear, R or L—R & R	.2
18–3	Hood, Side Panels—R & R	.1
18–4	Wheel Guards—R & R	.3
18–5	Windshield—R & R	1.0
18–6	Radio and Top—R & R	1.5

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R	.3
37–2	Battery Ground Cable—R & R	.3

Hydraulic System—Repair Code 63

Operation	Description	Time All Models
63–1	Hoses—R & R:	
	(a) Frame Coupling to "T"	.3
	(b) Pipe to Tank	.3
	(c) "T" to Vacuum Cylinder	.3
	(d) "T" to Valve	.3
	(e) Valve to Vacuum Cylinder	.3
63–2	Tubing—R & R:	
	(a) Tank to Frame Coupling	.4
	(b) Manifold to Check Valve	.4
63–3	Vacuum Cylinder Valve—Overhaul	.7
63–4	Vacuum Cylinder Valve—R & R	1.0
63–5	Vacuum Power Cylinder—Overhaul	.6
63–6	Vacuum Power Cylinder—R & R	1.4
63–7	Vacuum Tank—R & R	1.0

Hoist—Winch Assemblies—Repair Code 85

Operation	Description	Time All Models
85–1	Hoist Chain Sprockets—R & R	.9
85–2	Hoist Chains—Adjust	.3
85–3	Hoist Chains—R & R	.8
85–4	Hoist Drive Chain—Adjust	.4
85–5	Hoist Drive Chain—R & R	.6
85–6	Hoist Friction Wheel Assembly—Adjust	.4
85–7	Hoist Friction Wheel Assembly—Overhaul	2.7
85–8	Hoist Friction Wheel Assembly—R & R	1.5
85–9	Hoist Gear Cases—Adjust	.4
85–10	Hook or Shoes—R & R (One Side Only)	1.2
85–11	Hoist Shoes—Adjust	1.1
85–12	Hoist Shoe—Swing—Adjust	.6
85–13	Hook Swing Cylinder and Valve—Overhaul	.9
85–14	Hook Swing Cylinder and Valve—R & R	.6
85–15	Load Hook Limit Stops—Adjust	.2

TRUCK, HAND, LIFT, PALLET, ELECTRIC (ALL CAPACITIES)

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls—Linkage Springs
16—Tires
18—Body—Guards and Hoods
37—Battery
50—Motors
52—Controls
63—Hydraulic

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time All Models
11–1	Drive Axle—R & R	1.1
11–2	Drive Chain—R & R	.6
11–3	Drive Mechanism Support—R & R	2.5
11–4	Drive Wheel—R & R	1.1
11–5	Drive Wheel Bearings—R & R	1.2
11–6	Drive Wheel Sprocket—R & R	1.1
11–7	Jackshaft—R & R	1.3
11–8	Jackshaft Bearings—R & R	1.4
11–9	Jackshaft Sprocket (large)—R & R	.8
11–10	Jackshaft Sprocket (small)—R & R	1.1

Brakes—Repair Code 12

Operation	Description	Time All Models
12–1	Brake—Adjust	.2
12–2	Brake Shoes—R & R	.7
12–3	Brake Shoes—Reline (out-of-unit)	.2
12–4	Brake Shoes—Reline—Bonded	.2
12–5	Brake Spring—R & R	.3

Front Axle—Wheels—Controls—Linkage Springs—Repair Code 13

Operation	Description	Time All Models
13–1	Steer Turntable—Adjust	.7
13–2	Steer Turntable Race—R & R	1.1
13–3	Steering—Inspect and Service	.3
13–4	Steering Handle—R & R	.8
13–5	Steering Handle Return Spring—R & R	.2
13–6	Steering Handle Support—R & R	.8
13–7	Turntable Adjustment Ring—R & R	.8

Tires—Repair Code 16

Operation	Description	Time All Models
16–1	Tire—R & R	1.2

Body—Guards and Hoods—Repair Code 18

Operation	Description	Time All Models
18–1	Booster Roller—R & R	.2
18–2	Fork Assembly—Remove, Overhaul and Replace	2.5
18–3	Frame Return Springs—R & R	.1
18–4	Lift Chain—R & R	.6
18–5	Lift Chain Sprocket—R & R	1.0
18–6	Lower Lifting Cam—R & R	1.0

Body—Guards and Hoods—Repair Code 18—Continued

Operation	Description	Time All Models
18–7	Pull Rods—Adjust	.2
18–8	Pull Rods—R & R	.5
18–9	Rear Wheel—R & R	.6

Battery—Repair Code 37

Operation	Description	Time All Models
37–1	Battery—R & R (Check all Grounds)	.1
37–2	Battery Plug—R & R	.5
37–3	Charging Plug—R & R	.5

Motors—Repair Code 50

Operation	Description	Time All Models
50–1	Drive Motor—Clean and Inspect	.3
50–2	Drive Motor—R & R	1.2
50–3	Drive Motor—Overhaul	6.0
50–4	Drive Motor Chain—R & R	.3
50–5	Drive Motor Sprocket—R & R	.4
50–6	Pump Motor—R & R	1.0
50–7	Pump Motor—Overhaul	4.0

Controls—Repair Code 52

Operation	Description	Time All Models
52–1	Controller Contacts—One Set—R & R	.2
	Add for each additional set replaced	(.1)
52–2	Contacts (All)—Clean and Service	.9
52–3	Forward Push Button Switch—R & R	.3
52–4	Drive Motor Controller—Inspect and Clean	.2
52–5	Control Handle (Harness)—R & R	1.3
52–6	Pump Motor Controller—Inspect and clean	.2
52–7	Reverse Push Button Switch—R & R	.3
52–8	Up-Down Push Button Switch—R & R	.3
52–9	Horn—R & R	.3
52–10	Horn Button—R & R	.3
52–11	Battery Flush	.3
52–12	Battery Cable Lug Resolder	.5

Hydraulic—Repair Code 63

Operation	Description	Time All Models
63–1	Hydraulic Cylinder—R & R	1.6
63–2	Hydraulic Cylinder—Overhaul	1.0
63–3	Hydraulic Lines—One—R & R	.3
63–4	Hydraulic Pump—R & R	1.0
63–5	Hydraulic Tank—R & R	.7
63–6	Piston Rod Packing—R & R	.5
63–7	Release Valve—R & R	.6

TRUCK, LIFT, FORK, ROUGH TERRAIN, GAS, PRT (ALL CAPACITIES)

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Code 1800

		Time
A	Lift Forks—R & R	.2
B	Seat—R & R	.2
C	Gas Tank—R & R (Includes Operation B)	.5
D	Block Up Front or Rear End	.1

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01–1	Engine—Bore for Sleeves	13.2
01–2	Engine—Bore Oversize	7.2
01–3	Engine—Disassemble	2.3
01–4	Engine—Dynamometer Test	2.2
01–5	Engine—R & R	7.7
01–6	Engine—Reassemble	8.5
01–7	Engine—Tune-Up	.8
01–8	Engine Head and Gasket—R & R	1.0
01–9	Engine Mount Springs—R & R	.4
01–10	Engine Tappets—Adjust	2.8
01–11	Engine Timing Gear Cover and Gasket—R & R	8.2
01–12	Engine Valve Spring—R & R	2.5
01–13	Oil Gage—R & R	.3

Clutch—Repair Code 02

Operation	Description	Time
02–1	Clutch—Adjust	.2
02–2	Clutch Facing—Reline	.3
02–3	Clutch Pedal Springs—R & R	.3
02–4	Flywheel—R & R	4.6
02–5	Flywheel Ring Gear—Install	.1
02–6	Pressure Plate, Facing and Release Bearing—R & R	3.5
02–7	Pressure Plate—Overhaul	.6

Fuel System—Repair Code 03

Operation	Description	Time
03–1	Accelerator Spring—R & R	.1
03–2	Air Filter—Clean	.1
03–3	Carburetor—Overhaul	.5
03–4	Carburetor—R & R	.3
03–5	Carburetor and Governor—Adjust	.2
03–6	Carburetor Return Spring—R & R	.1
03–7	Fuel Filter—Clean	.1
03–8	Fuel Gage—R & R	.3
03–9	Fuel Pump—Overhaul	.3
03–10	Fuel Pump—R & R	.4
03–11	Fuel Tank—R & R	.6

Exhaust System—Repair Code 04

Operation	Description	Time
04–1	Exhaust Pipe and Gasket—R & R	.7
04–2	Heat Control Thermostat—R & R	.1
04–3	Intake and Exhaust Section Gasket—R & R	1.0
04–4	Manifold and Gasket—R & R	1.7
04–5	Muffler—R & R	.6
04–6	Muffler, Exhaust Pipe and Gasket—R & R	.9

Cooling System—Repair Code 05

Operation	Description	Time
05–1	Engine Drain Cock—R & R	.1
05–2	Fan Belt—R & R	.1
05–3	Fan Blade—R & R	.2
05–4	Head Water Outlet Gasket—R & R	.3
05–5	Radiator—R & R	1.2
05–6	Radiator Drain Cock—R & R	.1
05–7	Radiator Hose—R & R	.2
05–8	Water Pump—Overhaul	.5
05–9	Water Pump—R & R	1.4
05–10	Temperature Gage—R & R	.3
05–11	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time
06–1	Ammeter—R & R	.3
06–2	Coil—R & R	.2
06–3	Distributor—Overhaul	.5
06–4	Distributor—R & R	.2
06–5	Generator—Adjust	.2
06–6	Generator—R & R	.3
06–7	Horn—R & R or Adjust	.3
06–8	Horn Button—R & R	.3
06–9	Ignition Switch—R & R	.3
06–10	Spark Plugs—R & R	.3
06–11	Spark Plug Wires—R & R	.3
06–12	Starter—R & R	.4
06–13	Starter Cable—R & R	.2
06–14	Starter Switch—R & R	.5
06–15	Voltage Regulator—Adjust	.3
06–16	Voltage Regulator—R & R	.3
06–17	Hour Meter—R & R	.3
06–18	Battery—Flush	.3
06–19	Battery Cable Lug Resolder	.5

Transmission—Repair Code 07

Operation	Description	Time
07–1	Ring and Pinion Gear Assembly—Overhaul	1.0
07–2	Transmission—Overhaul	3.0
07–3	Transmission—R & R	3.0
07–4	Transmission—Replace Grease Seals and Inspect	1.3

Automatic Transmission

Operation	Description	Time
07–5	Automatic Transmission—R & R	3.4
07–6	Automatic Transmission Oil Pump—R & R (Add Automatic Transmission R & R for Front Pump)	1.8

TIME STANDARDS—Continued

Automatic Transmission—Continued

Operation	Description	Time
07-7	Automatic Transmission Housing Oil Seal—R & R	1.0
07-8	Automatic Transmission Regulator Valve Body—R & R	3.4
07-9	Automatic Transmission Governor Assembly—Recondition	1.8

Drive Shaft and Universal—Repair Code 09

Operation	Description	Time
09-1	Universal Joint—R & R	.5
09-2	Universal Joint—Replace Bearings	1.0

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11-1	Differential Assembly—Overhaul	2.3
11-2	Differential Assembly—R & R	3.0
11-3	Rear Axle—R & R	1.8
11-4	Wheels, Drive—R & R	.8

Brakes—Repair Code 12

Operation	Description	Time
12-1	Brake Adjustment, Major	.8
12-2	Brake Adjustment, Minor	.3
12-3	Brake Cylinder—Overhaul (out-of-unit)	.3
12-4	Brake Cylinder—R & R	1.3
12-5	Brake Line, Central—R & R	.2
12-6	Brake Line, L or R—R & R	.3
12-7	Brake Lines—Bleed	.2
12-8	Brake Pedal—Adjust	.2
12-9	Brake Pedal Springs—R & R	.3
12-10	Brake Shoes, Bonded—Reline	.2
12-11	Brake Shoes—R & R	1.2
12-12	Brake Shoes—Reline (Per Wheel)	.2
12-13	Hand Brake—Adjust	.3
12-14	Hand Brake Band—Reline	.1
12-15	Master Cylinder—Overhaul (out-of-unit)	.3
12-16	Master Cylinder—R & R	.3

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13-1	Steer Wheels—Repack	.5
13-2	Steering—Inspect	.3
13-3	Steering Assembly—Overhaul	1.9
13-4	Steering Assembly—R & R	1.7
13-5	Steering Axle Drag Line—R & R	.6
13-6	Steering Gear—Overhaul	.8
13-7	Steering Gear—R & R	.7
13-8	Steering Wheel—R & R	.2

Power Steering

Operation	Description	Time
13-9	Cylinder, Steering, Air Booster—R & R	.8
13-10	Valve, Relief—R & R	.3
13-11	Valve Assembly, Control—R & R	.5
13-12	Pump, Hydraulic—R & R	.5
13-13	Flexible Oil Line—R & R	.2
13-14	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time
16-1	Drive Wheels—Retire	1.4
16-2	Steer Wheels—Retire	.7

Battery—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	.1
37-2	Battery Ground Cable—R & R	.1

Hydraulic System—Repair Code 63

Operation	Description	Time
63-1	Hydraulic Oil Tank—R & R	.9
63-2	Hydraulic Pump and Gasket—R & R	.8
63-3	Lift Cylinder—Overhaul	2.6
63-4	Lift Cylinder to Tank Line—R & R	.5
63-5	Pump to Valve Hydraulic Line—R & R	.4
63-6	Tank to Pump Hydraulic Line—R & R	.5
63-7	Tilt Cylinder—Overhaul	.7
63-8	Valve—R & R	.6
63-9	Valve to Lift Cylinder Line—R & R	.3
63-10	Valve to Tilt Cylinder Line—R & R	.4

Section 21—Equipment Maintenance Code 1810

TRUCK, LIFT, FORK, ROUGH TERRAIN, GAS, CRAWLER (ALL CAPACITIES)

REPAIR CODES

01—Engine
02—Engine Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Final Drive
13—Controls and Steering Mechanism
18—Tracks and Frame
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Code 1810

		Time
A	Lift Forks—R & R	.2
B	Hood—R & R	.2
C	Track Chain—R & R	.7

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01-1	Engine—Bore for Sleeves	13.2
01-2	Engine—Bore Oversize	7.2
01-3	Engine—Disassemble	2.3
01-4	Engine—Dynamometer Test	2.2
01-5	Engine—R & R	7.7
01-6	Engine—Reassemble	8.5
01-7	Engine—Tune-Up	.8
01-8	Engine Head and Gasket—R & R	1.0
01-9	Engine Mount Springs—R & R	.4
01-10	Engine Tappets—Adjust	2.8
01-11	Engine Timing Gear Cover and Gasket—R & R.	8.2
01-12	Engine Valve Spring—R & R	2.5
01-13	Oil Gage—R & R	.3

Engine Clutch—Repair Code 02

Operation	Description	Time
02-1	Clutch—Adjust	.2
02-2	Clutch Facing—Reline	.3
02-3	Clutch Lever—R & R	.4
02-4	Flywheel —R& R	4.6
02-5	Flywheel Ring Gear—Install	.1
02-6	Pressure Plate—Facing and Release Bearing—R & R	3.5
02-7	Pressure Plate—Overhaul	.6

Fuel System—Repair Code 03

Operation	Description	Time
03-1	Air Filter—Clean	.1
03-2	Carburetor—Overhaul	.5
03-3	Carburetor—R & R	.3
03-4	Carburetor and Governor—Adjust	.2
03-5	Carburetor Return Spring—R & R	.1
03-6	Engine Speed Control Lever—R & R	.2
03-7	Fuel Filter—Clean	.1
03-8	Fuel Pump—Overhaul	.3
03-9	Fuel Pump—R & R	.4
03-10	Fuel Tank—R & R	.6

Exhaust System—Repair Code 04

Operation	Description	Time
04-1	Exhaust Pipe and Gasket—R & R	.7
04-2	Heat Control Thermostat—R & R	.1
04-3	Intake and Exhaust Section Gasket—R & R	1.0
04-4	Manifold and Gasket—R & R	1.7
04-5	Muffler—R & R	.6
04-6	Muffler, Exhaust Pipe and Gasket—R & R	.9

Cooling System—Repair Code 05

Operation	Description	Time
05-1	Engine Drain Cock—R & R	.1
05-2	Fan Belt—R & R	.1
05-3	Fan Blade—R & R	.2
05-4	Head Water Outlet Gasket—R & R	.3
05-5	Radiator—R & R	1.2
05-6	Radiator Drain Cock—R & R	.1
05-7	Radiator Hose—R & R	.2
05-8	Water Pump—Overhaul	.5
05-9	Water Pump—R & R	1.4
05-10	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time
06-1	Ammeter—R & R	.3
06-2	Coil—R & R	.2
06-3	Distributor—Overhaul	.5
06-4	Distributor—R & R	.2
06-5	Generator—Adjust	.2
06-6	Generator—R & R	.3
06-7	Ignition Switch—R & R	.3
06-8	Spark Plugs—R & R	.3
06-9	Spark Plug, Wires—R & R	.3
06-10	Starter—R & R	.4
06-11	Starter Cable—R & R	.2
06-12	Starter Switch—R & R	.5
06-13	Voltage Regulator—Adjust	.3
06-14	Voltage Regulator—R & R	.3
06-15	Horn—R & R	.3
06-16	Horn Button—R & R	.3
06-17	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time
07-1	Ring and Pinion Gear Assembly—Overhaul	1.0
07-2	Transmission—Overhaul	3.0
07-3	Transmission—R & R	3.0
07-4	Transmission—Replace Grease Seals and Inspect	1.3

Final Drive—Repair Code 09

Operation	Description	Time
09-1	Drive Bevel Gear and Pinion—Adjust	.5
09-2	Drive Bevel Gear and Pinion—R & R	3.0
09-3	Sprocket—R & R	.7
09-4	Sprocket Drive Assembly—Overhaul	1.0
09-5	Sprocket Drive Assembly—R & R	2.0

TIME STANDARDS—Continued

Controls and Steering Mechanism—Repair Code 13

Operation	Description	Time
13-1	Brake Pedal—R & R (One)	.2
13-2	Steering—Inspect	.3
13-3	Steering Brake—Adjust (One)	.2
13-4	Steering Brake Assembly—R & R (One)	.5
13-5	Steering Brake Band—R & R (One)	.3
13-6	Steering Brake Band—Reline (One)	.1
13-7	Steering Clutch—Overhaul (One)	2.0
13-8	Steering Clutch—R & R (One)	3.0
13-9	Steering Clutch Control Lever—R & R (One)	.2
13-10	Steering Clutch Discs—R & R (One Clutch)	1.0
13-11	Steering Clutch Release Fork Assembly—R & R (One)	1.0

Tracks and Frame—Repair Code 18

Operation	Description	Time
18-1	Diagonal Brace—R & R	.5
18-2	Equalizer Spring—R & R	.5
18-3	Front Idler—Overhaul (One)	.4
18-4	Front Idler—R & R (One)	1.0
18-5	Front Idler Recoil Spring—R & R (One)	.5
18-6	Pivot Bearings—R & R (One)	.5
18-7	Recoil Spring—R & R (One)	.3
18-8	Stabilizer Roller Guide—R & R (One)	.8

Tracks and Frame—Repair Code 18—Continued

Operation	Description	Time
18-9	Track Chain—R & R (One)	.7
18-10	Track Frame—Inspect	.1
18-11	Track Frame—R & R	2.0
18-12	Track Idler—Overhaul (One)	.4
18-13	Track Idler—R & R (One)	.5
18-14	Track Link—R & R (One)	.4
18-15	Track Roller—Overhaul (One)	.3
18-16	Track Roller—R & R (One)	.5
18-17	Track Shoe—R & R (One)	.2

Battery—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	.1
37-2	Battery Ground Cable—R & R	.1

Hydraulic System—Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines—R & R	1.5
63-2	Hydraulic Oil Tank—R & R	.9
63-3	Hydraulic Pump and Gasket—R & R	.8
63-4	Lift Cylinder—Overhaul	2.6
63-5	Tilt Cylinder—Overhaul	.7
63-6	Valve—R & R	.6

Section 22—Equipment Maintenance Code 1820

TRUCK, LIFT, FORK, ROUGH TERRAIN, DIESEL, PRT (ALL CAPACITIES)

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Code 1820

		Time
A	Lift Forks—R & R	.2
B	Hood—R & R	.2
C	Seat—R & R	.2
D	Block Up Front or Rear End	.1

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01-1	Compression Test (One Cylinder)	.4
01-2	Engine—Bore for Sleeves	13.2
01-3	Engine—Disassemble	2.3
01-4	Engine—Dynamometer Test	2.2
01-5	Engine—R & R	7.7
01-6	Engine—Reassemble	8.5
01-7	Engine—Tune-Up	.8
01-8	Engine Head or Gasket—R & R	1.0
01-9	Engine Mount Springs—R & R	.4
01-10	Engine Rocker Arm Cover or Gasket—R & R	.4
01-11	Engine Timing Gear Cover or Gasket—R & R	8.2
01-12	Oil Gage—R & R	.3

Clutch—Repair Code 02

Operation	Description	Time
02-1	Clutch—Adjust	.2
02-2	Clutch Facing—Reline	.3
02-3	Clutch Pedal Springs—R & R	.3
02-4	Flywheel—R & R	4.6
02-5	Flywheel Ring Gear—Install	.1
02-6	Pressure Plate—Overhaul	.6
02-7	Pressure Plate Facing and Release Bearing—R & R	3.7

Fuel System—Repair Code 03

Operation	Description	Time
03-1	Accelerator Spring—R & R	.1
03-2	Air Filter—Clean	.1
03-3	Fuel Filter, Primary—Clean	.2
03-4	Fuel Filter, Secondary—Clean	.2
03-5	Fuel Gage—R & R	.3
03-6	Fuel Tank—R & R	.6
03-7	Injector, Fuel—Remove, Test, Replace	.5
03-8	System, Fuel—Clean Complete	1.0

Exhaust System—Repair Code 04

Operation	Description	Time
04-1	Exhaust Pipe and Gasket—R & R	.7
04-2	Exhaust Manifold and Gasket—R & R	1.4
04-3	Heat Control Thermostat—R & R	.1
04-4	Muffler—R & R	.6

Cooling System—Repair Code 05

Operation	Description	Time
05-1	Engine Drain Cock—R & R	.1
05-2	Fan Belt—R & R	.1

Cooling System—Repair Code 05—Continued

Operation	Description	Time
05-3	Fan Blade—R & R	.2
05-4	Head Water Outlet Gasket—R & R	.3
05-5	Radiator—R & R	1.2
05-6	Radiator Drain Cock—R & R	.1
05-7	Radiator Hose, Upper or Lower—R & R	.2
05-8	Water Pump—Overhaul	.5
05-9	Water Pump—R & R	1.4
05-10	Temperature Gage—R & R	.3

Electrical System—Repair Code 06

Operation	Description	Time
06-1	Generator—Adjust	.2
06-2	Generator—R & R	.3
06-3	Horn—R & R or Adjust	.2
06-4	Horn Button—R & R	.1
06-5	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time
07-1	Ring and Pinion Gear Assembly—Overhaul	1.0
07-2	Transmission—Overhaul	4.7
07-3	Transmission—R & R	3.0
07-4	Transmission—Replace Grease Seals and Inspect	1.3

Automatic Transmission

Operation	Description	Time
07-5	Automatic Transmission—R & R	3.4
07-6	Automatic Transmission Oil Pump—R & R (Add Automatic Transmission R & R for Front Pump)	1.8
07-7	Automatic Transmission Housing Oil Seal—R & R	1.0
07-8	Automatic Transmission Regulator Valve Body—R & R	3.4
07-9	Automatic Transmission Governor Assembly—Recondition	1.8

Drive Shaft and Universal—Repair Code 09

Operation	Description	Time
09-1	Universal Joint—R & R	.5
09-2	Universal Joint Bearings—R & R	1.0

TIME STANDARDS—Continued

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11-1	Differential Assembly—Overhaul	2.3
11-2	Differential Assembly—R & R	3.0
11-3	Rear Axle—R & R	1.8
11-4	Wheels, Drive—R & R	.8

Brakes—Repair Code 12

Operation	Description	Time
12-1	Adjustment—Major	.8
12-2	Adjustment—Minor	.3
12-3	Brake Cylinder—Overhaul (out of unit)	.3
12-4	Brake Cylinder—R & R	1.3
12-5	Brake Line, Central—R & R	.2
12-6	Brake Line, L or R—R & R	.3
12-7	Brake Lines—Bleed	.2
12-8	Brake Pedal—Adjust	.2
12-9	Brake Shoes, Bonded—Reline	.2
12-10	Brake Shoes—R & R	1.2
12-11	Brake Shoes—Reline (per wheel)	.2
12-12	Hand Brake—Adjust	.3
12-13	Hand Brake Band—Reline	.1
12-14	Master Cylinder—Overhaul (out of unit)	.3
12-15	Master Cylinder—R & R	.3

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13-1	Steer Wheels—Repack	.5
13-2	Steering—Inspect	.3
13-3	Steering Assembly—Overhaul	1.9
13-4	Steering Assembly—R & R	1.7
13-5	Steering Axle Drag Link—R & R	.6
13-6	Steering Axle Spring—R & R (One)	2.1

Front Axle—Wheels—Controls—Repair Code 13—Continued

Operation	Description	Time
13-7	Steering Gear—Overhaul	.8
13-8	Steering Gear—R & R	.7
13-9	Steering Wheel—R & R	.2

Power Steering

Operation	Description	Time
13-10	Cylinder, Steering, Air Booster—R & R	.8
13-11	Valve, Relief—R & R	.3
13-12	Valve, Assembly, Control—R & R	.5
13-13	Pump, Hydraulic—R & R	.5
13-14	Flexible Oil Line—R & R	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time
16-1	Drive Wheels—Retire	1.4
16-2	Steer Wheels—Retire	.7

Battery—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	.1
37-2	Battery Ground Cable—R & R	.1

Hydraulic System—Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines—R & R	1.5
63-2	Hydraulic Oil Tank—R & R	.9
63-3	Hydraulic Pump and Gasket—R & R	.8
63-4	Lift Cylinder—Overhaul	2.6
63-5	Tilt Cylinder—Overhaul	.7
63-6	Valve—R & R	.6

TRUCK, LIFT, FORK, ROUGH TERRAIN, DIESEL, CRAWLER (ALL CAPACITIES)

REPAIR CODES

01—Engine
02—Engine Clutch
03—Fuel System
04—Exhaust System.
05—Cooling System
06—Electrical System
07—Transmission
09—Final Drive
13—Controls and Steering Mechanism
18—Tracks and Frame
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Code 1830

		Time
A	Lift Forks—R & R	.2
B	Hood—R & R	.2
C	Track Chain—R & R	.7

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01–1	Compression Test (One Cylinder)	.4
01–2	Engine—Bore for Sleeves	13.2
01–3	Engine—Disassemble	2.3
01–4	Engine—Dynamometer Test	2.2
01–5	Engine—R & R	7.7
01–6	Engine—Reassemble	8.5
01–7	Engine—Tune Up	.8
01–8	Engine Head or Gasket—R & R	1.0
01–9	Engine Mount Springs—R & R	.4
01–10	Engine Rocket Arm Cover or Gasket—R & R	.4
01–11	Engine Timing Gear Cover or Gasket—R & R	8.2
01–12	Oil Gage—R & R	.3

Engine Clutch—Repair Code 02

Operation	Description	Time
02–1	Clutch—Adjust	.2
02–2	Clutch Facing—Reline	.3
02–3	Clutch Lever—R & R	.4
02–4	Flywheel—R & R	4.6
02–5	Flywheel Ring Gear—Install	.1
02–6	Pressure Plate—Facing and Release Bearing—R & R	3.5
02–7	Pressure Plate—Overhaul	.6

Fuel System—Repair Code 03

Operation	Description	Time
03–1	Air Filter—Clean	.1
03–2	Fuel Filter, Primary—Clean	.2
03–3	Fuel Filter, Secondary—Clean	.2
03–4	Fuel Gage—R & R	.3
03–5	Fuel Tank—R & R	.6
03–6	Injector, Fuel—Remove—Test—Replace	.5
03–7	System, Fuel—Clean Complete	1.0

Exhaust System—Repair Code 04

Operation	Description	Time
04–1	Exhaust Pipe and Gasket—R & R	.7
04–2	Exhaust Manifold and Gasket—R & R	1.4
04–3	Heat Control Thermostat—R & R	.1
04–4	Muffler—R & R	.6

Cooling System—Repair Code 05

Operation	Description	Time
05–1	Engine Drain Cock—R & R	.1
05–2	Fan Belt—R & R	.1
05–3	Fan Blade—R & R	.2
05–4	Head Water Outlet Gasket—R & R	.3
05–5	Radiator—R & R	1.2

Cooling System—Repair Code 05—Continued

Operation	Description	Time
05–6	Radiator Drain Cock—R & R	.1
05–7	Radiator Hose, Upper or Lower—R & R	.2
05–8	Water Pump—Overhaul	.5
05–9	Water Pump—R & R	.4
05–10	Temperature Gage—R & R	.3
05–11	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time
06–1	Generator—Adjust	.2
06–2	Generator—R & R	.3
06–3	Headlights—R & R	.3
06–4	Horn—R & R	.3
06–5	Horn Button—R & R	.3
06–6	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time
07–1	Ring and Pinion Gear Assembly—Overhaul	1.0
07–2	Transmission—Overhaul	4.7
07–3	Transmission—R & R	3.0
07–4	Transmission—Replace Grease Seals and Inspect	1.3

Final Drive—Repair Code 09

Operation	Description	Time
09–1	Drive Bevel Gear and Pinion—Adjust	.5
09–2	Drive Bevel Gear and Pinion—R & R	3.0
09–3	Sprocket—R & R	.7
09–4	Sprocket Drive Assembly—Overhaul	1.0
09–5	Sprocket Drive Assembly—R & R	2.0

Controls and Steering Mechanism—Repair Code 13

Operation	Description	Time
13–1	Brake Pedal—R & R (One)	.2
13–2	Steering—Inspect	.3
13–3	Steering Brake—Adjust (One)	.2
13–4	Steering Brake Assembly—R & R (One)	.5
13–5	Steering Brake Band—R & R (One)	.3
13–6	Steering Brake Band—Reline (One)	.1
13–7	Steering Clutch—Overhaul (One)	2.0
13–8	Steering Clutch—R & R (One)	3.0
13–9	Steering Clutch Control Lever—R & R	.2
13–10	Steering Clutch Discs—R & R (One Clutch)	1.0
13–11	Steering Clutch Release Fork Assembly—R & R (One)	1.0

TIME STANDARDS—Continued

Tracks and Frame—Repair Code 18

Operation	Description	Time
18-1	Diagonal Brace—R & R	.5
18-2	Equalizer Spring—R & R	.5
18-3	Front Idler—Overhaul (One)	.4
18-4	Front Idler—R & R (One)	1.0
18-5	Front Idler Recoil Spring—R & R (One)	.5
18-6	Pivot Bearings—R & R (One)	.5
18-7	Recoil Spring—R & R (One)	.3
18-8	Stabilizer Roller Guide—R & R (One)	.8
18-9	Track Chain—R & R (One)	.7
18-10	Track Frame—Inspect	.1
18-11	Track Frame—R & R	2.0
18-12	Track Idler—Overhaul (One)	.4
18-13	Track Idler—R & R (One)	.5
18-14	Track Link—R & R (One)	.4
18-15	Track Roller—Overhaul (One)	.3

Tracks and Frame—Repair Code 18—Continued

Operation	Description	Time
18-16	Track Roller—R & R (One)	.5
18-17	Track Shoe—R & R (One)	.2

Battery—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	.1
37-2	Battery Ground Cable—R & R	.1

Hydraulic System—Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines—R & R	1.5
63-2	Hydraulic Oil Tank—R & R	.9
63-3	Hydraulic Pump and Gasket—R & R	.8
63-4	Lift Cylinder—Overhaul	2.6
63-5	Tilt Cylinder—Overhaul	.7
63-6	Valve—R & R	.6

TRUCK, SIDE LOADER, GAS

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
18—Hood and Body
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Codes 1840–1850

		Time
A	Lift Forks—R & R	.2
B	Mast—R & R (Includes Operation A)	1.5
C	Side Panels—R & R	.2
D	Gas Tank Cover—R & R	.2
E	Gas Tank—R & R (Includes Operation D)	.5
F	Block Up Front or Rear End	.2

TIME STANDARDS

Operation	Description	Time
01–1	Engine—Bore for Sleeves	13.2
01–2	Engine—Bore Oversize	7.2
01–3	Engine—Disassemble	2.3
01–4	Engine—Dynamometer Test	2.2
01–5	Engine—R & R	8.3
01–6	Engine—Reassemble	8.5
01–7	Engine—Tune-Up	.8
01–8	Engine Head and Gasket—R & R	1.0
01–9	Engine Mount Springs—R & R	.4
01–10	Engine Tappets—Adjust	2.8
01–11	Engine Timing Gear Cover and Gasket—R & R	8.2
01–12	Engine Valve Spring—R & R	2.5
01–13	Oil Gage—R & R	.3

Clutch—Repair Code 02

Operation	Description	Time
02–1	Clutch—Adjust	.2
02–2	Clutch Facing—Reline	.3
02–3	Clutch Pedal Springs—R & R	.3
02–4	Flywheel—R & R	4.6
02–5	Flywheel Ring Gear—Install	.1
02–6	Pressure Plate—Overhaul	.6
02–7	Pressure Plate Facing and Release Bearing—R & R	3.5

Fuel System—Repair Code 03

Operation	Description	Time
03–1	Accelerator Spring—R & R	.1
03–2	Air Filter—Clean	.1
03–3	Carburetor—Overhaul	.5
03–4	Carburetor—R & R	.4
03–5	Carburetor and Governor—Adjust	.2
03–6	Carburetor Return Spring—R & R	.1
03–7	Fuel Filter—Clean	.1
03–8	Fuel Gage—R & R	.3
03–9	Fuel Pump—Overhaul	.3
03–10	Fuel Pump—R & R	.4
03–11	Fuel Tank—R & R	.6

Exhaust System—Repair Code 04

Operation	Description	Time
04–1	Exhaust Pipe and Gasket—R & R	.7
04–2	Heat Control Thermostat—R & R	.1
04–3	Intake and Exhaust Section Gasket—R & R	1.0
04–4	Manifold and Gasket—R & R	1.7
04–5	Muffler—R & R	.6
04–6	Muffler, Exhaust Pipe and Gaskets—R & R	.9

Cooling System—Repair Code 05

Operation	Description	Time
05–1	Engine Drain Cock—R & R	.1
05–2	Fan Belt—R & R	.2
05–3	Fan Blade—R & R	.3
05–4	Head Water Outlet Gasket—R & R	.3
05–5	Radiator—R & R	1.5
05–6	Radiator Drain Cock—R & R	.1
05–7	Radiator Hose—R & R	.2
05–8	Water Pump—Overhaul	.5
05–9	Water Pump—R & R	1.4
05–10	Temperature Gage—R & R	.3
05–11	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time
06–1	Ammeter—R & R	.3
06–2	Coil—R & R	.2
06–3	Distributor—Overhaul	.5
06–4	Distributor—R & R	.2
06–5	Generator—Adjust	.2
06–6	Generator—R & R	.3
06–7	Horn—R & R or Adjust	.3
06–8	Horn Button—R & R	.3
06–9	Ignition Switch—R & R	.3
06–10	Spark Plugs—R & R	.3
06–11	Spark Plug Wires—R & R	.3
06–12	Starter—R & R	.5
06–13	Starter Cable—R & R	.3
06–14	Starter Switch—R & R	.5
06–15	Voltage Regulator—Adjust	.3
06–16	Voltage Regulator—R & R	.3
06–17	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time
07–1	Ring and Pinion Gear Assembly—Overhaul	1.0
07–2	Transmission—Overhaul	3.0
07–3	Transmission—R & R	3.0
07–4	Transmission—Replace Grease Seals and Inspect	1.3

Automatic Transmission

Operation	Description	Time
07–5	Automatic Transmission—R & R	3.4
07–6	Automatic Transmission Oil Pump R & R (Add Automatic Transmission R & R for Front Pump)	1.8

TIME STANDARDS—Continued

Automatic Transmission—Continued

Operation	Description	Time
07-7	Automatic Transmission Housing Oil Seal—R & R	1.0
07-8	Automatic Transmission Regulator Valve Body—R & R	3.4
07-9	Automatic Transmission Governor Assembly—Recondition	1.8

Drive Shaft and Universal—Repair Code 09

Operation	Description	Time
09-1	Universal Joint—R & R	0.5
09-2	Universal Joint—Replace Bearings	1.0

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11-1	Differential Assembly—Overhaul	2.4
11-2	Differential Assembly—R & R	3.2
11-3	Rear Axle—R & R	1.8
11-4	Wheels, Drive—R & R	.8

Brakes—Repair Code 12

Operation	Description	Time
12-1	Brake Adjustment, Major	0.8
12-2	Brake Adjustment, Minor	.3
12-3	Brake Cylinder—Overhaul (out of unit)	.3
12-4	Brake Cylinder—R & R	1.3
12-5	Brake Line, Central—R & R	.2
12-6	Brake Line, L or R—R & R	.3
12-7	Brake Lines—Bleed	.2
12-8	Brake Pedal—Adjust	.2
12-9	Brake Shoes, Bonded—Reline	.2
12-10	Brake Shoes—R & R	1.2
12-11	Brake Shoes—Reline (Per Wheel)	.2
12-12	Hand Brake—Adjust	.3
12-13	Hand Brake Band—Reline	.1
12-14	Master Cylinder—Overhaul (out of unit)	.3
12-15	Master Cylinder—R & R	.3

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13-1	Steer Wheels—Repack	0.5
13-2	Steering—Inspect	.3

Front Axle—Wheels—Controls—Repair Code 13—Continued

Operation	Description	Time
13-3	Steering Assembly—Overhaul	1.9
13-4	Steering Assembly—R & R	1.7
13-5	Steering Axle Drag Link—R & R	.6
13-6	Steering Gear—Overhaul	.8
13-7	Steering Gear—R & R	.7
13-8	Steering Wheel—R & R	.2

Power Steering

Operation	Description	Time
13-9	Cylinder, Steering, Air Booster—R & R	0.8
13-10	Valve, Relief—R & R	.3
13-11	Valve Assembly, Control—R & R	.5
13-12	Pump, Hydraulic—R & R	.5
13-13	Flexible Oil Line—R & R	.2
13-14	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time
16-1	Drive Wheels—Retire	1.4
16-2	Steer Wheels—Retire	.7

Hood and Body—Repair Code 18

Operation	Description	Time
18-1	Floor Plates—R & R	0.2
18-2	Hood Side Panel—R & R	.1
18-3	Lift Chains—R & R	1.0
18-4	Lift Forks—R & R	.2
18-5	Mast—Overhaul (out of unit)	3.5
18-6	Mast—R & R	2.0

Battery—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	0.2
37-2	Battery Ground Cable—R & R	.1

Hydraulic System—Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines—R & R	1.5
63-2	Hydraulic Oil Tank—R & R	.9
63-3	Hydraulic Pump and Gasket—R & R	.8
63-4	Lift Cylinder—Overhaul	2.6
63-5	Tilt Cylinder—Overhaul	.7
63-6	Valve—R & R	.6

TRUCK, SIDE LOADER, DIESEL

REPAIR CODES

01—Engine
02—Clutch
03—Fuel System
04—Exhaust System
05—Cooling System
06—Electrical System
07—Transmission
09—Drive Shaft and Universal
11—Rear Axle and Differential
12—Brakes
13—Front Axle—Wheels—Controls
16—Tires
18—Hood and Body
37—Battery
63—Hydraulic System

BASIC STANDARDS—EM Codes 1860 and 1870

		Time
A	Lift Forks—R & R	.2
B	Mast—R & R (Includes Operation A)	1.5
C	Side Panels—R & R	.2
D	Fuel Tank Cover—R & R	.2
E	Fuel Tank—R & R (Includes Operation D)	.5
F	Block Up Front or Rear End	.2

TIME STANDARDS

Engine—Repair Code 01

Operation	Description	Time
01–1	Compression Test (One Cylinder)	.4
01–2	Engine—Bore for Sleeves	13.2
01–3	Engine—Disassemble	2.3
01–4	Engine—Dynamometer Test	2.2
01–5	Engine—R & R	7.7
01–6	Engine—Reassemble	8.5
01–7	Engine—Tune-Up	.8
01–8	Engine Head or Gasket—R & R	1.0
01–9	Engine Mount Springs—R & R	.4
01–10	Engine Rocker Arm Cover or Gasket—R & R	.4
01–11	Engine Timing Gear Cover or Gasket—R & R	8.2
01–12	Oil Gage—R & R	.3

Clutch—Repair Code 02

Operation	Description	Time
02–1	Clutch—Adjust	.2
02–2	Clutch Facing—Reline	.3
02–3	Clutch Pedal Springs—R & R	.3
02–4	Flywheel—R & R	4.6
02–5	Flywheel Ring Gear—Install	.1
02–6	Pressure Plate—Overhaul	.6
02–7	Pressure Plate Facing and Release Bearing—R & R	3.7

Fuel System—Repair Code 03

Operation	Description	Time
03–1	Accelerator Spring—R & R	.1
03–2	Air Filter—Clean	.1
03–3	Fuel Filter, Primary—Clean	.2
03–4	Fuel Filter, Secondary—Clean	.2
03–5	Fuel Gage—R & R	.3
03–6	Fuel Tank—R & R	.6
03–7	Injector, Fuel—Remove—Test—Replace	.5
03–8	System, Fuel—Clean Complete	1.0

Exhaust System—Repair Code 04

Operation	Description	Time
04–1	Exhaust Pipe and Gasket—R & R	.7
04–2	Exhaust Manifold and Gasket—R & R	1.4
04–3	Heat Control Thermostat—R & R	.1
04–4	Muffler—R & R	.6

Cooling System—Repair Code 05

Operation	Description	Time
05–1	Engine Drain Cock—R & R	.1
05–2	Fan Belt—R & R	.1
05–3	Fan Blade—R & R	.2
05–4	Head Water Outlet Gasket—R & R	.3
05–5	Radiator—R & R	1.2
05–6	Radiator Drain Cock—R & R	.1
05–7	Radiator Hose, Upper or Lower—R & R	.2
05–8	Water Pump—Overhaul	.5
05–9	Water Pump—R & R	1.4
05–10	Temperature Gage—R & R	.3
05–11	Cooling System—Flush	1.0

Electrical System—Repair Code 06

Operation	Description	Time
06–1	Generator—Adjust	.2
06–2	Generator—R & R	.3
06–3	Horn—R & R or Adjust	.3
06–4	Horn Button—R & R	.3
06–5	Hour Meter—R & R	.3

Transmission—Repair Code 07

Operation	Description	Time
07–1	Ring and Pinion Gear Assembly—Overhaul	1.0
07–2	Transmission—Overhaul	4.7
07–3	Transmission—R & R	3.0
07–4	Transmission—Replace Grease Seals and Inspect	1.3

Automatic Transmission

Operation	Description	Time
07–5	Automatic Transmission—R & R	3.4
07–6	Automatic Transmission Oil Pump—R & R (Add Automatic Transmission R & R for Front Pump)	1.8
07–7	Automatic Transmission Housing Oil Seal—R & R	1.0
07–8	Automatic Transmission Regulator Valve Body—R & R	3.4
07–9	Automatic Transmission Governor Assembly—Recondition	1.8

TIME STANDARDS—Continued

Drive Shaft and Universal—Repair Code 09

Operation	Description	Time
09-1	Universal Joint—R & R	.5
09-2	Universal Joint Bearings—R & R	1.0

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11-1	Differential Assembly—Overhaul	2.3
11-2	Differential Assembly—R & R	3.0
11-3	Rear Axle—R & R	1.8
11-4	Wheels, Drive—R & R	.8

Brakes—Repair Code 12

Operation	Description	Time
12-1	Adjustment—Major	.8
12-2	Adjustment—Minor	.3
12-3	Brake Cylinder—Overhaul (Out of Unit)	.3
12-4	Brake Cylinder—R & R	1.3
12-5	Brake Line, Central—R & R	.2
12-6	Brake Line, L or R—R & R	.3
12-7	Brake Lines—Bleed	.2
12-8	Brake Pedal—Adjust	.2
12-9	Brake Shoes, Bonded—Reline	.2
12-10	Brake Shoes—R & R	1.2
12-11	Brake Shoes—Reline (Per Wheel)	.2
12-12	Hand Brake—Adjust	.3
12-13	Hand Brake Band—Reline	.1
12-14	Master Cylinder—Overhaul (Out of Unit)	.3
12-15	Master Cylinder—R & R	.3

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13-1	Steer Wheels—Repack	.5
13-2	Steering—Inspect	.3
13-3	Steering Assembly—Overhaul	1.9
13-4	Steering Assembly—R & R	1.7
13-5	Steering Axle Drag Link—R & R	.6
13-6	Steering Axle Spring—R & R (One)	2.1
13-7	Steering Gear—Overhaul	.8

Front Axle—Wheels—Controls—Repair Code 13—Continued

Operation	Description	Time
13-8	Steering Gear—R & R	.7
13-9	Steering Wheel—R & R	.2

Power Steering

Operation	Description	Time
13-10	Cylinder, Steering, Air Booster—R & R	.8
13-11	Valve, Relief—R & R	.3
13-12	Valve, Assembly, Control—R & R	.5
13-13	Pump, Hydraulic—R & R	.5
13-14	Flexible Oil Line—R & R	.2
13-15	Hose, Hydraulic, Gear Pump to Control Valve—R & R	.2

Tires—Repair Code 16

Operation	Description	Time
16-1	Drive Wheels—Retire	1.4
16-2	Steer Wheels—Retire	.7

Hood and Body—Repair Code 18

Operation	Description	Time
18-1	Floor Plates—R & R	.2
18-2	Hood Side Panel—R & R	.1
18-3	Lift Chains—R & R	1.0
18-4	Lift Forks—R & R	.2
18-5	Mast—Overhaul (Out of Unit)	3.5
18.6	Mast—R & R	2.0

Battery—Repair Code 37

Operation	Description	Time
37-1	Battery—R & R	.1
37-2	Battery Ground Cable—R & R	.1

Hydraulic System—Repair Code 63

Operation	Description	Time
63-1	Hydraulic Lines—R & R	1.5
63-2	Hydraulic Oil Tank—R & R	.9
63-3	Hydraulic Pump and Gasket—R & R	.8
63-4	Lift Cylinder—Overhaul	2.6
63-5	Tilt Cylinder—Overhaul	.7
63-6	Valve—R & R	.6

TRUCK, SIDE LOADER, ELECTRIC (ALL CAPACITIES)

REPAIR CODES

11—Rear Axle and Differential
12—Brakes
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16—Tires
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37—Battery
50—Motors
52—Controls
63—Hydraulic System

TIME STANDARDS

Rear Axle and Differential—Repair Code 11

Operation	Description	Time
11–1	Differential—Overhaul (out-of-unit)	2.5
11–2	Differential—R & R	3.5
11–3	Drive Axle—R & R	1.2
11–4	Drive Wheels—R & R	.9
11–5	Wheel Bearings—R & R	.9

Brakes—Repair Code 12

Operation	Description	Time
12–1	Brake Adjustment—Major	1.1
12–2	Brake Adjustment—Minor	.3
12–3	Brake Cylinder—Overhaul (out-of-unit)	.3
12–4	Brake Cylinder—R & R	1.0
12–5	Brake Line, Central—R & R	.2
12–6	Brake Line, L or R—R & R	1.0
12–7	Brake Lines—Bleed	.8
12–8	Brake Pedal—Adjust	.2
12–9	Brake Shoes—R & R	1.2
12–10	Brake Shoes, Bonded—Reline	.2
12–11	Brake Shoes—Reline (Per Wheel)	.2
12–12	Drive Motor Brake Spring—R & R	.4
12–13	Master Cylinder—Overhaul (out-of-unit)	.3
12–14	Master Cylinder—R & R	.3

Front Axle—Wheels—Controls—Repair Code 13

Operation	Description	Time
13–1	Steer Wheels—Repack	.5
13–2	Steering—Inspect	.3
13–3	Steering Assembly—Overhaul	1.9
13–4	Steering Assembly—R & R	1.7
13–5	Steering Axle Drag Link—R & R	.6
13–6	Steering Gear—Overhaul	.8
13–7	Steering Gear—R & R	.7
13–8	Steering Wheel—R & R	.2

Tires—Repair Code 16

Operation	Description	Time
16–1	Drive Wheels—Retire	1.4
16–2	Steer Wheels—Retire	.7

Hood and Body—Repair Code 18

Operation	Description	Time
18–1	Floor Plates—R & R	.2
18–2	Lift Chains—R & R	1.0

Hood and Body—Repair Code 18—Continued

Operation	Description	Time
18–3	Lift Forks—R & R	.2
18–4	Mast—Overhaul (out-of-unit)	3.5
18–5	Mast—R & R	2.0

Battery—Repair Code 37

Operation	Description	Time
37–1	Battery—R & R	.3
37–2	Battery Plug—R & R	.4
37–3	Charging Plug—R & R	.4

Motors—Repair Code 50

Operation	Description	Time
50–1	Drive Motor—Clean and Inspect	.5
50–2	Drive Motor—R & R	4.0
50–3	Drive Motor Wires—R & R	.3
50–4	Tilt and Lift Motor—Clean and Inspect	.4
50–5	Tilt and Lift Motor—R & R	2.0
50–6	Tilt and Lift Motor Wires—R & R	.2

Controls—Repair Code 52

Operation	Description	Time
52–1	Contact Release Springs—R & R	.5
52–2	Contacts—R & R (One Set)	.2
52–3	Controller Contact Springs—R & R	.1
52–4	Drive, Lift or Tilt Controller—Repair	Est.
52–5	Drive Motor Controller—Clean and Inspect	.5
52–6	Drive Motor Controller—R & R	.6
52–7	Reversing Drum Contacts—R & R	.5
52–8	Tilt and Lift Motor Controller—Clean and Inspect	.5
52–9	Horn—R & R	.3
52–10	Horn Button—R & R	.3
52–11	Hour Meter—R & R	.3
52–12	Battery Flush	.3
52–13	Battery Cable Lug Resolder	.5

Hydraulic System—Repair Code 63

Operation	Description	Time
63–1	Hydraulic Lines—R & R	1.5
63–2	Hydraulic Oil Tank—R & R	.9
63–3	Hydraulic Pump and Gasket—R & R	.8
63–4	Lift Cylinder—Overhaul	2.6
63–5	Tilt Cylinder—Overhaul	.7
63–6	Valve—R & R	.6

APPENDIX A

INDEX OF FIGURES

APPENDIX B

RELATED PUBLICATIONS

Management of Transportation Equipment, NAVFAC P-300, provides specific schedules and requirements for crane maintenance, inspection and testing.

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Handling Ammunition, Explosives, and Hazardous Materials with Industrial Materials Handling Equipment (MHE), NAVSEA OP 4098, provides safety precautions in handling munitions, categorizes hazardous locations, describes and provides testing and inspection of MHE.

Technical manuals which accompany the MHE from the manufacture. They are a source of pertinent information on operation, maintenance, preventive maintenance, troubleshooting, repair, replacement, parts breakdown, lubrication, scheduling, and other data related to the specific unit of MHE.